

ROADS AND STREETS

AUGUST 1946

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THERE'S A

Timken Rock Bit

FOR PRACTICALLY
EVERY KIND OF ROCK



The R series; a bit used in soft formations, such as limestone and sandstone.

The M series; an intermediate bit to the H and D series, designed largely for mining with heavy-duty equipment.

The D series; a bit used with heavy drilling machines and large section drill steels.

The H series; a general purpose bit for light and medium weight drills adaptable to any popular hollow drill steel section.

The F series; a sturdy bit designed to achieve fast drilling by virtue of its small gauge.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
ROCK BITS

Introduced fourteen years ago, the Timken Rock Bit of today bears a remarkably close resemblance to those on the market in 1932. Improvements have been made—streamlined then, it's more streamlined now; heavy wing sections have become heavier—but basically it's the same design. Fourteen years' experience has confirmed its correctness.

THE TIMKEN ROLLER BEARING COMPANY, CANTON 6, OHIO



*faster action
with ADAMS
motor graders*



Picture shows an Adams Motor Grader finishing a new road. Adams conveniently located cab controls enabled operator to get all blade positions required for bank sloping, ditching and surface work—without leaving cab to make mechanical adjustments.

● When you buy an Adams Motor Grader you get action—*fast action* . . . the kind that pays big dividends in time and money. For example:

Adams' Push-Button Starting starts the big Diesel engines, quickly, easily—gets grader going without loss of time.

Adams' Fast Transport Speed—up to 21 mph—gets grader to the job faster . . . means more time on the job—at work.

Adams' Power-Operated Blade Controls move the blade at fast constant speeds to virtually all desired positions—*without costly,*

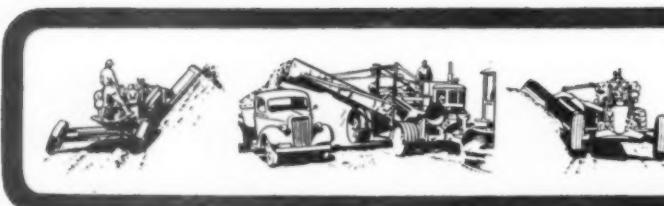
time-wasting stops for mechanical adjustments.

Adams' 8 Overlapping Forward Speeds instantly provide fastest practical speed for every grading operation.

Adams' Positive Mechanical Steering assures fast, safe directional control—at all times, at all speeds.

In every phase of design and construction, you'll find Adams Motor Graders built to deliver faster, smoother, more efficient operation—to do more work, better, at lower cost. See your local Adams dealer.

J. D. ADAMS MANUFACTURING CO., INDIANAPOLIS, IND.



ADAMS
ROAD BUILDING AND
EARTH-MOVING EQUIPMENT



The New Cars are Going Places

Travel-hungry owners of new cars won't be content with around-the-block driving. They'll be taking to the open road—heading for seashore, lake or mountains, or distant hunting ground, or maybe just to satisfy the urge to travel.

As car and truck production mounts, motor traffic promises to surpass anything this country has seen. That means more roads. Two-lane, four-lane, even six-lane highways will be needed to handle this heavier traffic swiftly and safely.

If you have a contract for a highway job, Bethlehem's steel service

to contractors offers advantages well worth considering. By placing a single order with Bethlehem for all the steel needed on a highway project you save in several ways. You save bookkeeping. You save needless follow-ups. And you save by avoiding delays.

When you use Bethlehem's steel service all the steel required for the job is supplied from a single, dependable source. Shipment from a strategically-located Bethlehem warehouse is so scheduled that each individual item is delivered to the job when you are ready for it.

LEADING BETHLEHEM HIGHWAY PRODUCTS

Road Joints	Reinforcing Bars
Bar Mats	Guard Rail
Guard Rail Posts and Brackets	
Wire Rope and Strand	
Hollow Drill Steel	
Fabricated Steel Construction	
Sheet and H-Piling	
Tie-Rods, Spikes, Bolts and Nuts	

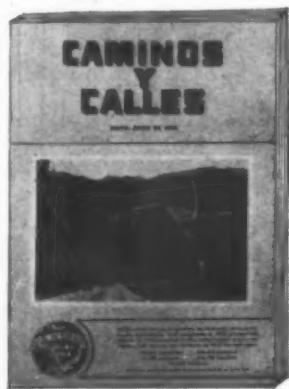
BETHLEHEM STEEL COMPANY
Bethlehem, Pa.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation



STEEL for HIGHWAYS

Your Latin American Ambassador For Equipment



CAMINOS Y CALLES goes as a good-will builder for you to a special group of public officials, engineers, contractors and equipment distributors concerned with building, improving and maintaining the highways of Latin America.

It is printed in Spanish with a section in Portuguese. Manufacturers of equipment and materials seeking an export market can reach the key buyers through CAMINOS Y CALLES without waste circulation. It is distributed to all Latin American countries and furnishes a CCA audit of 10,700 circulation.

Large credit balances have been built up in the U. S. by these Latin American countries. They are in need of all types of road building equipment—and they like it American made!

New—Catalog Issue

A new Reference and Data Catalog section will be incorporated in an early 1947 issue of CAMINOS Y CALLES. This will give the manufacturer a place for his Catalog message to this specialized group—a year-round-interest issue. Be sure to plan for this special issue in your 1947 budget.

Write for particulars on
Caminos y Calles and on new
Reference and Data issue.

Gillette
PUBLISHING COMPANY

330 South Wells Street
Chicago 6, Illinois

New York • Cleveland • Los Angeles • San Francisco

ROADS AND STREETS

No. 8

AUGUST, 1946

Vol. 89

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A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations, and to the construction and maintenance of airports.

WITH ROADS AND STREETS HAVE BEEN COMBINED GOOD ROADS MAGAZINE AND ENGINEERING & CONTRACTING

HALBERT P. GILLETTE, President; EDWARD S. GILLETTE, Publisher; HAROLD J. MCKEEVER, Editor; CHARLES T. MURRAY, Managing Editor; H. K. GLIDDEN, Eastern Editor (N. Y.); LT. COL. V. J. BROWN, Publishing Director (Absent on Military Duty); H. J. CONWAY, Advertising Editor; L. R. VICKERS, Promotional Director.

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A complete package!

NEW LORAIN TL-20 COMES TO YOUR JOB READY FOR WORK

Choose your mounting and type of boom equipment and that does it! The TL-20, as a standard unit, comes to you with all the so-called "extras" built in, plus a lot more premium features never before offered by a machine in the $\frac{1}{2}$ -yd. class.

Check these features, then inspect a TL-20 at your nearest Thew-Lorain distributor. You'll find it a "complete package" full of many profitable surprises.

The Thew Shovel Company
LORAIN, OHIO

FIRST WITH THE FEATURES THAT COUNT

No Extras—all essential and desirable accessories (starter, generator, lights, etc.) are built as standard into every unit.

Unit Assembly—each major component (clutch shaft, engine, etc.) can be removed and interchanged as a complete unit.

2-Speed Crawler—2 speeds, standard equipment, available in both directions. Chain driven. Oil enclosed propelling mechanism.

Rubber-Tire Mountings—choice of nine mountings (Moto-Crane and Self-Propelled types) on 4 or 6 wheel units with or without front wheel drive.

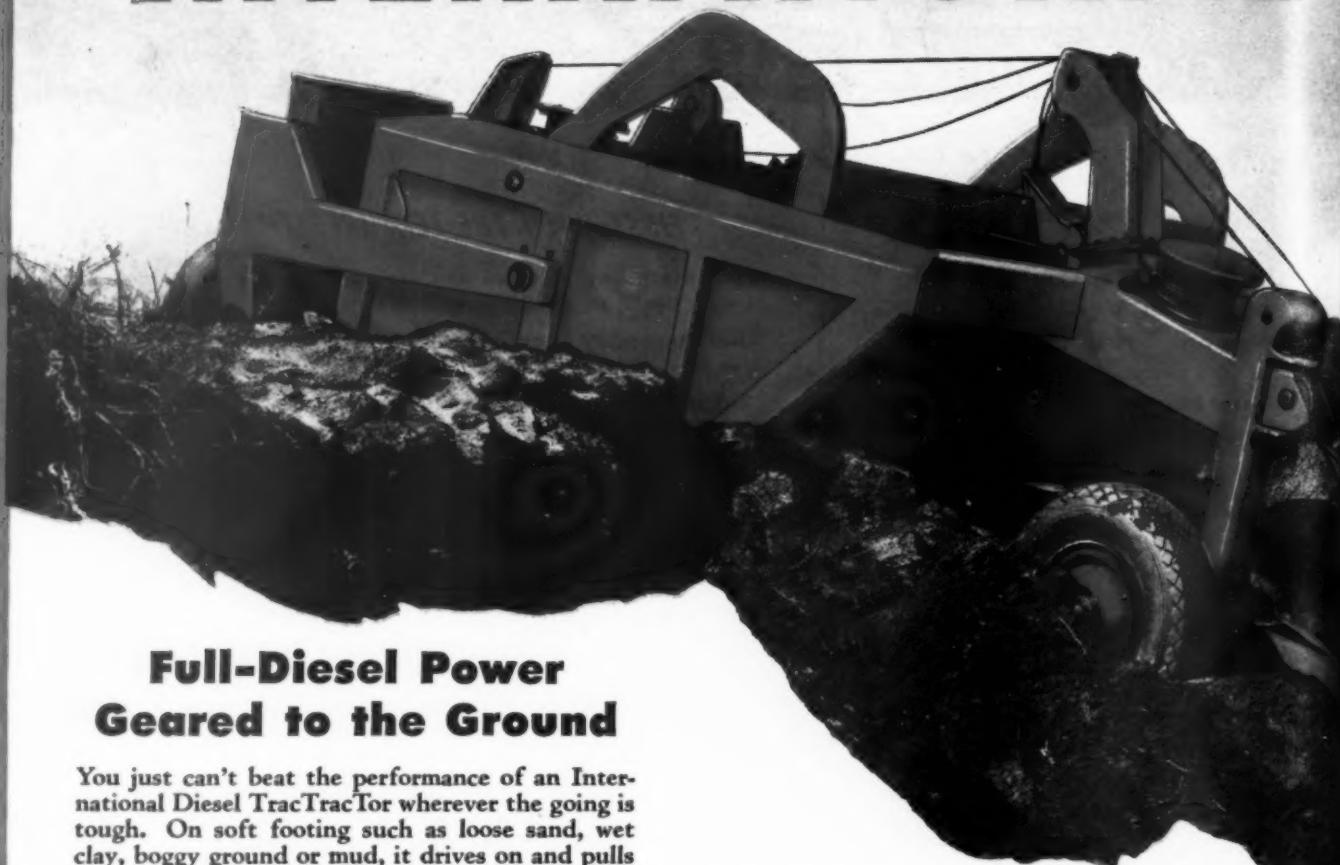
5 Interchangeable Booms—available with interchangeable boom assemblies for shovel, crane, dragline, clamshell and hoe operation.

One-Piece Bed—turntable bed consists of a one-piece, all-welded, all-steel unit, which revolves on four Hook Rollers.



The NEW Lorain **TL-20**

INTERNATIONAL



Full-Diesel Power Geared to the Ground

You just can't beat the performance of an International Diesel TracTracTor wherever the going is tough. On soft footing such as loose sand, wet clay, boggy ground or mud, it drives on and pulls its load through as no other type of tractor can do. This ability to take hold and convert power into pull, regardless of footing, yields profits. More work is packed into each hour otherwise wasted in idleness or expensive maneuvering.

Beyond this immediate benefit is the long-range money-satisfaction of International's unbeatable operating economy. For example, the advanced-design fuel injection and combustion system of International Diesels extract the last ounce of power from fuel consumed. This keeps fuel costs down to bedrock, assures longer life for the engine. Sturdy construction and matchless service accessibility of every part of the tractor reduce maintenance to the minimum, avoid unnecessary and expensive down time.

Add to these the many other superior features of International TracTracTor design and operation—which the nearest International Industrial Power Distributor is prepared to explain and demonstrate. You'll agree that, for the tough jobs in earth-moving, construction, lifting, carrying and

excavating, International Diesel Crawlers are unbeatable. They provide the kind of traction that takes hold, that assures maximum power at drawbar or 'dozer blade under every conceivable working condition.

You'll be ahead, with this combination: International Diesel TracTracTors and the matched equipment available through International Industrial Power Distributors. Yes, you'll be ahead in many ways—in lower-cost power, in time-saving performance with equipment tailored to your operations. That's why it will pay to standardize on International Tractors, Power Units and International-powered equipment. Look into the profit possibilities of their use on the jobs you're planning, now.

Industrial Power Division

INTERNATIONAL HARVESTER COMPANY

180 North Michigan Avenue • Chicago 1, Illinois

Listen to "Harvest of Stars" Every Sunday, 2 p.m., E.S.T. / NBC Network



TRACTRACTORS

Provide effective traction
for **MAXIMUM POWER**



INTERNATIONAL *Industrial Power*



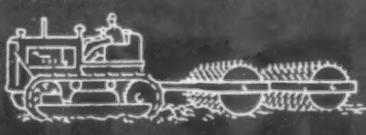
TRACTRACTORS



POWER UNITS



WHEEL TRACTORS





PERFECT TEAMWORK

FOR FAST, LOW-COST ROAD REPAIR,

REBUILDING and MAINTENANCE

CATERPILLAR

REG. U.S. PAT. OFF.

K



The "Caterpillar" Diesel equipment pictured here is owned by Saline County, Kansas. Also owns 6 other "Caterpillar" Diesel Motor Graders and 3 additional "Caterpillar" Diesel Tractors.

A "Caterpillar" Diesel Motor Grader and a "Caterpillar" Diesel Tractor equipped with Traxcavator shovel-loader make just about the most valuable combination of implements a county highway department can have.

They speed the job at both ends wherever there's fill or surfacing material to be dug and spread. "Adjacent" dirt can be moved and dumped by the Traxcavator. In distant pits it loads the hauling trucks in double-quick time.

The Motor Grader is just as versatile. It can spread and level as fast as the trucks can deliver. And it can also be used for scarifying,

back-sloping, reshaping, stabilizing, ditching, mixing surfacing materials or removing snow.

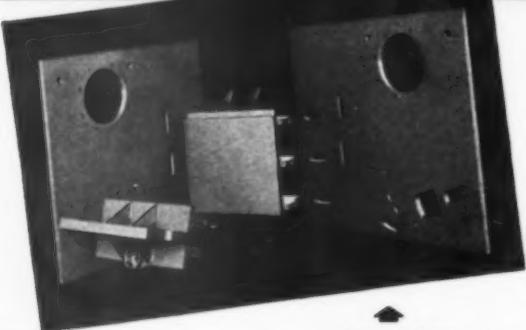
Here's the payoff: In "Caterpillar" Diesels, taxpayers or contractors have equipment that saves money — not only on every mile of road work but in the rugged, long-lived quality and in the low maintenance cost of the machinery itself. "Caterpillar" Diesels have become a byword for the very tops in power and earthmoving equipment. What's more, "Caterpillar" nation-wide dealer service has no equal for keeping every unit on the job and "on its toes."

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

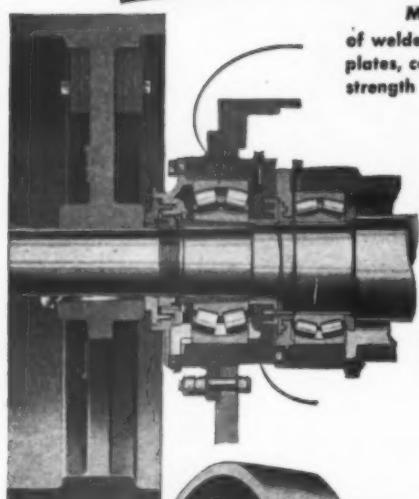
DIESEL

ENGINES • TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT

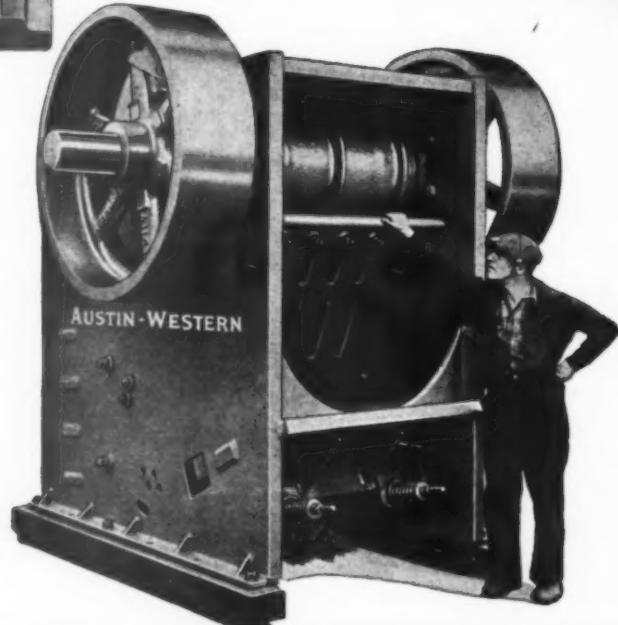
THESE ARE THE THINGS That Boost Production



MAIN FRAME
of welded, high carbon steel plates, combines tremendous strength with light weight.



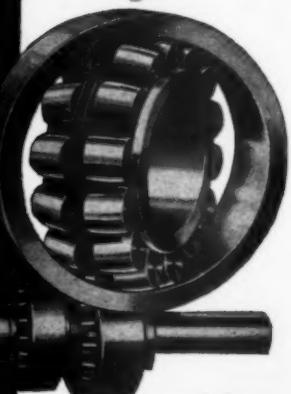
BEARING ASSEMBLY
minimizes shaft strain by mounting main and pitman bearings close together.



HEAVY PITMAN
is accurately bored to accommodate the precision eccentric bearings.

S.K.F. BEARINGS
of self-aligning type, protect load-bearing surfaces.

MAIN SHAFT
is forged, heat-treated, machined, ground, and polished.



STEEL TOGGLE
is of uniform width, and proper and uniform strength.

- Pictured on this page are but a few of the many exclusive features of design and construction which are responsible for the ability of *Austin-Western High-Speed Jaw Crushers* to exceed ordinary output standards by wide margins.

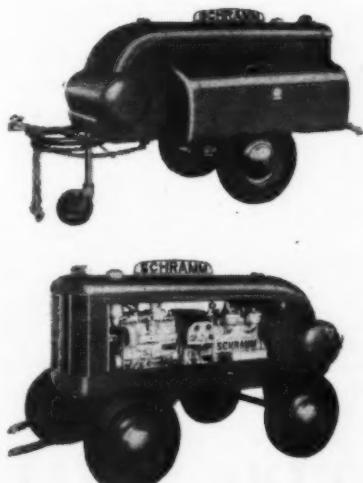
Bulletin 1960 tells the whole story. Your nearby A-W distributor will be glad to send you a copy.

AUSTIN-WESTERN COMPANY
AURORA, ILLINOIS, U. S. A.

BUILDERS OF ROAD MACHINERY
Austin  **Western**
SINCE 1859



WHERE YOUR VERSATILE AIR COMPRESSOR COMES FROM!



The big Schramm Plant, with greatly increased facilities, furnishes air compressors to all industries. That represents thousands of Schramm Compressors, portable and stationary, now being used for every type of compressed air job.

Illustrated are two Schramm models. These units . . . as all Schramm Compressors . . . are lightweight, compact, rugged. They contain such features as 100% watercooled, mechanical intake valve, forced feed lubrication.

Schramm Compressors are modern to meet modern needs. Facilities, workmanship, knowledge, all go into the manufacturing of each Schramm, and it is for these reasons you get real savings when you use a Schramm Air Compressor.

For complete details, write us today.

SCHRAMM INC.

THE COMPRESSOR PEOPLE
WEST CHESTER
PENNSYLVANIA



THIS WALL KEEPS A ROADWAY out of other people's business

When this roadway was elevated to bridge level the normal slope would have trespassed on private property. However, engineers provided a simple, economical solution by installing an ARMCO Bin-Type Retaining Wall to shorten the slope and confine it within the right-of-way.

ARMCO Walls are ideal for unstable slopes, rights-of-way, stream erosion and similar problems. You can easily

erect them with unskilled labor in any season. And the cost is low.

Backfilling is done as the job progresses and undermining during construction is arrested. The flexible strength of ARMCO Walls overcomes unequal settlement without danger of cracking or bulging. Curves and changes in elevation are no problem and, should conditions change, these sturdy retaining walls can readily

be extended or moved to a new site.

Use an ARMCO Bin-Type Retaining Wall when you want speed of erection, strength and economy. It is the practical solution wherever embankments must be stabilized or confined. Tell us about that next earth retention job and we'll send you specific information. Armco Drainage & Metal Products, Inc., and Associated Companies, 2195 Curtis Street, Middletown, Ohio.

An ARMCO Retaining Wall confines this slope — prevents it from trespassing upon the grounds of a nearby industrial plant. Note the Flex-Beam Guardrail that provides a safety approach to the bridge.



ARMCO



BIN-TYPE RETAINING WALLS

Yes... Much More Work Done

Allis-Chalmers TORQUE CONVERTER Boosts Tractor Output

The Allis-Chalmers torque converter method of transmitting tractor engine power livens up tractor performance — gets much more work done.

With a torque converter, highest possible speeds at which load can be moved are automatically selected in each of the three forward and reverse speed ranges. This gives you infinite working speeds in each gear — from zero to maximum. Assures peak tractor performance at all times. Keeps gear shifting to an absolute minimum.

There's no restarting, either. Engine cannot be stalled!

Operation is continuously smooth. Cushion of oil between engine and tractor train protects tractor and auxiliary equipment from shock and abuse. There's more time on the job . . . less money spent on repairs, overhaul!

Operators go for it, too! Smooth, easy operation, less gear shifting, means less fatigue — more work done!

Yes . . . moving dirt with torque converter tractors is a new construction experience . . . worth your immediate investigation.

A "flying" project from the start! Four A-C torque converter tractors really make the dirt fly on this million yd. airport project at Greenbelt, Md. Owner F. W. Schrom also speeds maintenance and finishing with an Allis-Chalmers Model A-D Motor Grader.



Below: Torque converters plus pusher loading . . . this is the way to really move dirt! Owner Schrom assures himself of fastest possible loading and hauling, capacity loads every trip, with this combination.



ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

NOW! 1-STOP LOADING FOR 2-BATCH TRUCKS



AT YOUR AGGREGATE PLANT AS
WELL AS YOUR BULK CEMENT PLANT

With the new Johnson Dual Aggregate Batching Plant, you can now take full advantage of 1-stop loading of 2-batch trucks at both the aggregate and the bulk cement plant. Johnson Dual Aggregate Batching Plant discharges both batches into a 2-batch truck simultaneously. Extra "spot-stops" are eliminated. On most jobs, the number of hauling units can be reduced. 100 yard, 3 compartment portable section bin is equipped with 2 multiple material batchers. One operator controls both batchers. (Of course, all Johnson Bulk Cement Plants may also be equipped with 2 batchers—for 1-stop loading of 2-batch trucks.)



THE C. S. JOHNSON COMPANY
KOEHRING SUBSIDIARY • CHAMPAIGN, ILLINOIS

GETS BIGGER BITES with CLEANER BUCKETS

Clean trencher buckets take bigger bites. On the Parsons 250 Trenchliner each bucket that bites into the trench is clean. Spring loaded bucket scraper (see picture below) cleans out sticky materials as bucket load is dumped, leaves each bucket empty. Gumbo clay can't stick, can't cut down trenching efficiency. Here are more reasons why the bucket line on the Parsons 250 Trenchliner can dig more trench per day: 1. Light weight, high strength digging buckets have wear resisting cutting lips. 2. Bucket teeth are forged of abrasion-resistant alloy steel. 3. Same teeth are used for both bucket and side-cutters. 4. Excavator chain links are heat hardened. 5. Connecting pins are self-locking, have no cotters.



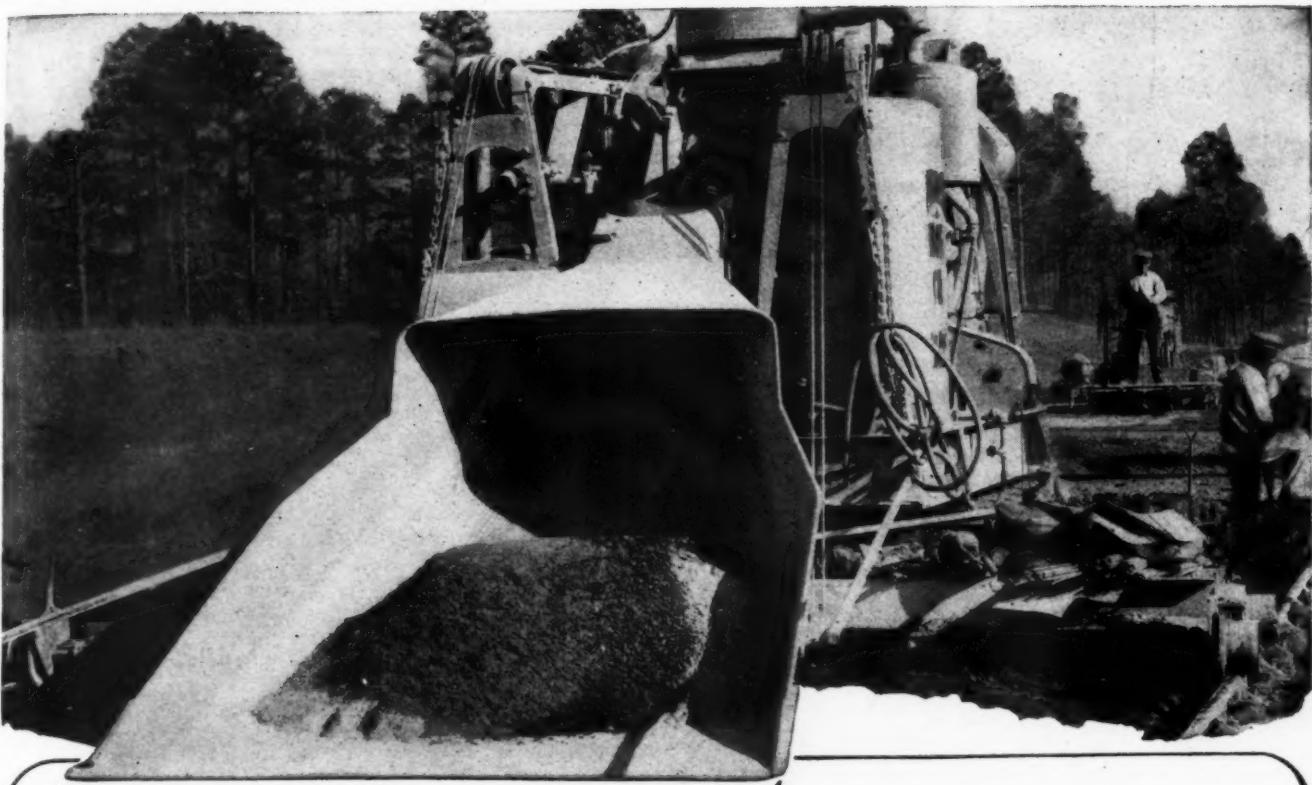
PARSONS 250 TRENCHLINER



Spring loaded bucket
scraper scoops out sticky
material. Cleaned-out
buckets take bigger bites.



THE PARSONS COMPANY
KOEHRING SUBSIDIARY • NEWTON, IOWA



WHEN YOU'RE **BACKING IN BATCH TRUCKS**
THAT EXTRA FOOT *HERE* COUNTS A LOT

● The skip of the Koehring 34-E *Twinbatch* Paver is 10 feet wide, approximately a foot wider than other paver skips. When you're backing batch trucks into a paver skip, fast, that extra foot means a lot. You're in and out just a little faster. And "just a little faster" means big money on a paving job.

For the Koehring *Twinbatch*, that big 10-foot skip is just right because the *Twinbatch* is a big, Heavy-Duty paver, almost 12 feet wide, weighing 60,400 pounds, and every pound working weight.

Double, continuous, self-equalizing cables raise the skip in 8 seconds. Each cable alone is strong enough to raise the loaded skip. Replaceable liners keep abrasive wear away from the skip throat. Welded lip, with extra tire tread plates, acts as a ramp, makes it easier for trucks to get into skip on a rough grade.



KOEHRING COMPANY, Milwaukee 10, Wis.

HEAVY-DUTY CONSTRUCTION EQUIPMENT



GEARED TO THE EARTH — FOR FASTER LOADING



with **MAXIMUM** Traction and Weight
on Drive-Wheel Centers

WOOLDRIDGE

EARTHMOVING EQUIPMENT

Includes



★ **SCRAPERS**
Tractor-drawn for han-
dling heaping yardages
from 6 to 28 cu. yards.



★ **POWER CONTROL
UNITS**
Single and multiple drum
with universal or roller
fairleads.



★ **BULLDOZERS**
Tough and rugged design
for standard makes of
tractors.



★ **TRAILBUILDERS**
Adjustable angle-blades
for standard tractor
mounting.



★ **RIPPERS**
Available in light, medi-
um and heavy duty mod-
els with two sizes to each
model.

**DISTRIBUTOR SALES & SERVICE
FACILITIES IN ALL PRINCIPAL
AREAS & FOREIGN TERRITORIES**

The scraper unit of Wooldridge Terra-Cobra Earthmovers is suspended from a rigid yoke and frame which connects to the engine unit by means of the massive oscillating King Pin. This design concentrates maximum weight of the combined units, fully loaded or empty, directly over drive wheel centers which provides greatest possible traction for positive travel. At no time does this tractive weight shift—even when the bowl is dropped for loading. For fast, low cost earthmoving, gear your operations to Terra-Cobras. Get full details today.

WOOLDRIDGE
MANUFACTURING COMPANY
SUNNYVALE • CALIFORNIA • U.S.A.

COBRA

TERRA

High-Speed
Self-Propelled
EARTHMOWERS

Why You Need *Finishers* For Large-Area Surfacing

• An important requirement for large area surfacing—such as airport runways, super highways, parking lots, playgrounds, etc.—is that there be *no ridges or breaks in the entire surface area*. With so many of these jobs coming up now and in the near future, B-G Finishers are even more important to you.

These Tamping-Leveling finishers match the joints evenly—they compact and tamp each succeeding strip firmly in place against the previous one.

Because of this even compaction across the full width of the mat (including the joint) you get a ridge-free continuous surface area. There is the same density across the joint that there is in the rest of the strip.

The B-G Tamping-Leveler finisher will lay any mix, hot or cold, loosely graded or sheet asphalt—and up to 6 inches thick. Also, it gives you a mat of uniform density and a smooth level surface over an irregular sub-base.

Your Barber-Greene representative has catalogs on Barber-Greene asphalt equipment and data on its performance on jobs like yours. Barber-Greene Company, Aurora, Illinois.

Barber-Greene tamping-leveling finisher laying $4\frac{1}{4}$ million sq. ft. of black top for 130 acres of parking lot at the Santa Anita race track. Griffith Company, contractors.

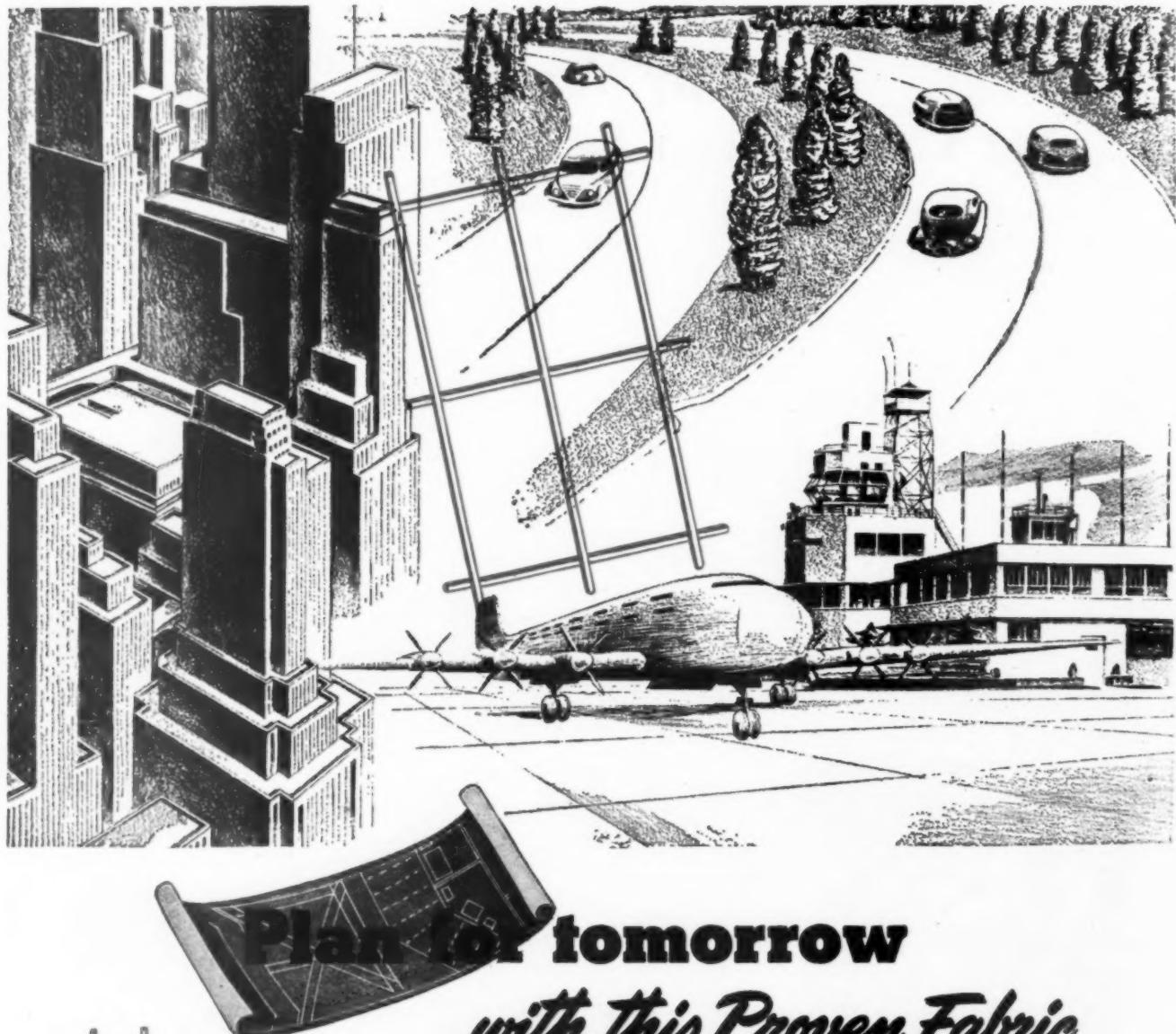


4-18



CONSTANT FLOW EQUIPMENT





At our busiest airports, on our best paved streets and highways, in our tallest buildings, you can see how concrete construction contributes to modern living.

Welded Wire Fabric, the most vital factor in concrete construction, is invisible in the concrete slab, but imparts the strength and stamina to control cracks that may form in concrete.

American Welded Wire Fabric is the most widely used prefabricated concrete reinforcement. Its closely spaced steel wires are electrically welded into a prefabricated mat which fortifies against major stresses and strains.

Many additional uses of concrete will be made possible by the ability of this versatile reinforcement to meet new requirements. So when you are planning for tomorrow, it will pay you to know *all* of the ways you can use American Welded Wire Fabric. For wherever it is practical, it is also economical.

LISTEN TO . . . the "Hour of Mystery" presented by United States Steel on the radio every Sunday evening. Consult your newspaper for time and station.



American Steel & Wire Company

*Cleveland, Chicago and New York
Columbia Steel Company, San Francisco,
Pacific Coast Distributors
Tennessee Coal, Iron & Railroad Company, Birmingham
Southern Distributors
United States Steel Export Company, New York*

UNITED STATES STEEL

a big paver...



MULTIFOOTE
Duomix
(DUAL DRUM)
34E
CONCRETE
PAVER

No other big paver offers the ease of maintenance and operation that results from the simplicity of the MultiFoote Duomix—the new double drum paver!

Lift the covers under the deck. Here is the main operating machinery with the power take-off. Only one main drive shaft. Few gears. Simple—easy to get at!

The power take-off consists of helical cut gears running in oil in an oil tight case. The drum drive shaft is special chrome molybde-

num steel. Gears are wide faced and clutches are large and cool running. All high speed shafts are mounted on Timken bearings.

The power discharge, bucket drive and boom hoist mechanisms are in an easily accessible housing over the boom pivot.

Operating controls are easy to handle and grouped for short reach. Use of only one lever sets the automatic cycle in operation.

MultiFoote Duomix simplicity means money on a paving job! Ask for Catalog.

MULTIFOOTE

THE FOOTE COMPANY, INC.
1935 State Street
Nunda, N. Y.

Duomix 34E

ALL THESE JOBS with THIS ONE TOOL!



Breaking Concrete,
Rock, Ice, etc.



Asphalt Cutting



Sheeting Driving



Dirt Tamping



Dirt Tamping



Clay Digging



Spike Driving

Thor

PAVING BREAKERS

More than just a Buster is a Thor Paving Breaker! With moil points, chisels, wedges, and broaches in 7 styles it breaks concrete, rock, ice, and other materials. With wide-bladed spades it digs clay and hard-pan; cuts asphalt; splits timbers. With a tamper tool it pounds backfill. With an interchangeable Front Head it drives spikes. With another Head it drives sheeting.

And, whatever the job, Thor Breakers are bonus makers. An exclusive short-travel tubular valve, that gets more work from all the air, controls the extra power to drive a reversible, block-type piston in smooth blows. Rugged construction, full air-cushioning and automatic lubrication reduce wear. Get these benefits on your jobs now —ask your nearby Thor Distributor.

INDEPENDENT PNEUMATIC TOOL COMPANY

600 W. Jackson Blvd., Chicago 6, Illinois

Birmingham Boston Buffalo Cleveland Detroit Los Angeles Milwaukee New York Philadelphia
Pittsburgh St. Louis Salt Lake City San Francisco Toronto, Canada London, England

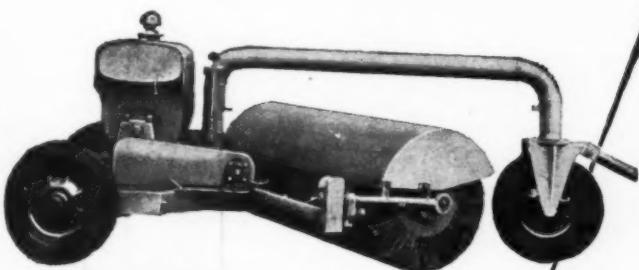
Thor **PORTABLE POWER**
TOOLS

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS

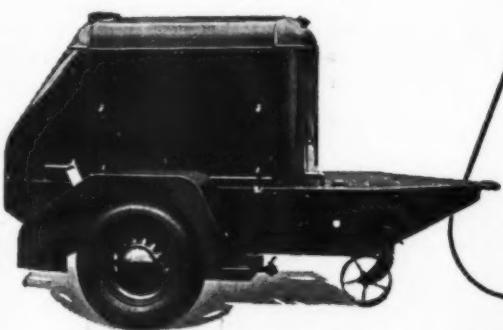
IT'S NOT WHAT
YOU LIKE TO DO - BUT WHAT YOU DO
THAT COUNTS



"SPRAY MASTER"
PRESSURE DISTRIBUTOR



ROAD BROOM



"TANKAR"
STEAM HEATER

SUPPLY TANK



LITTLEFORD

454 E. PEARL ST.,

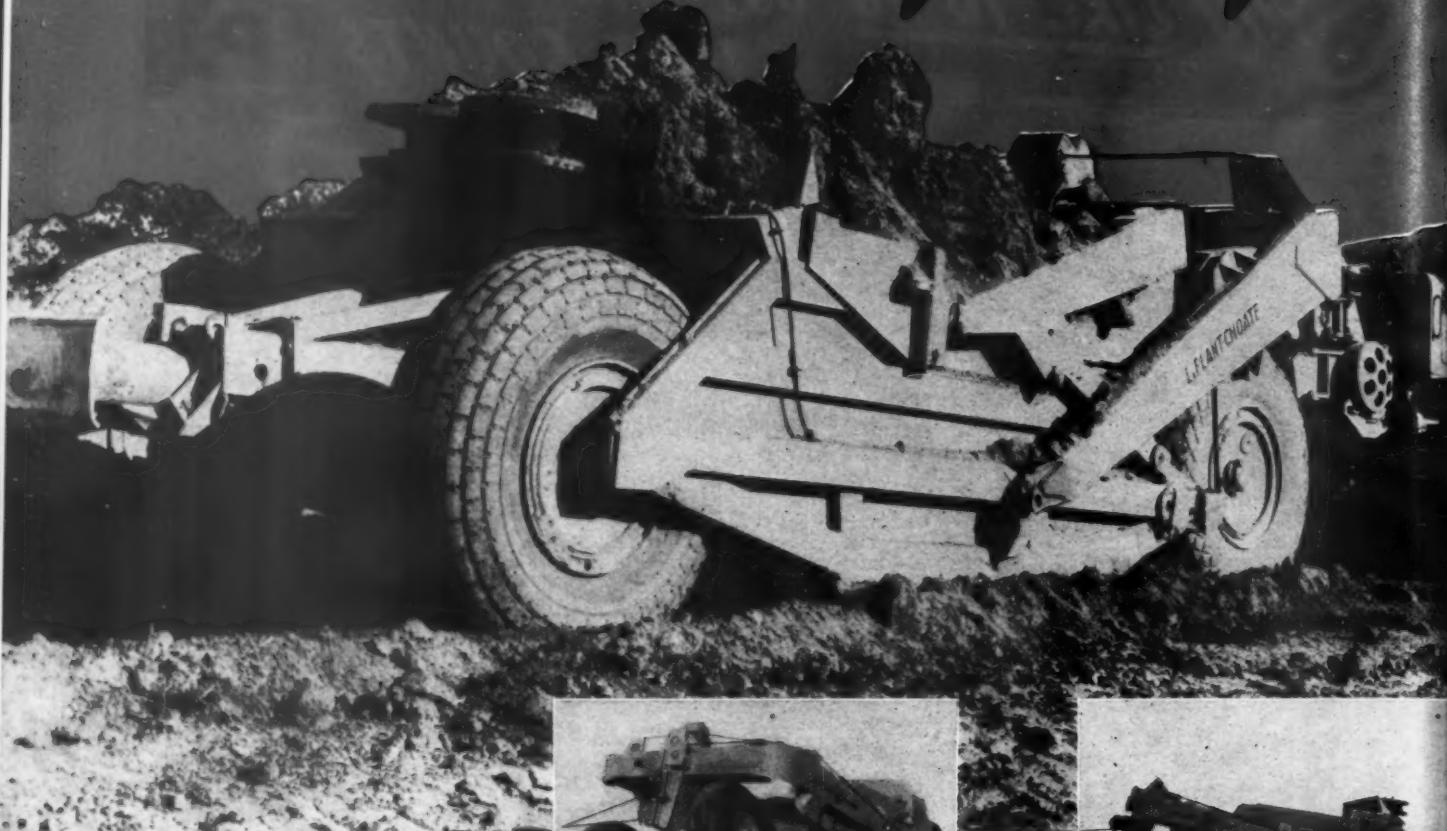
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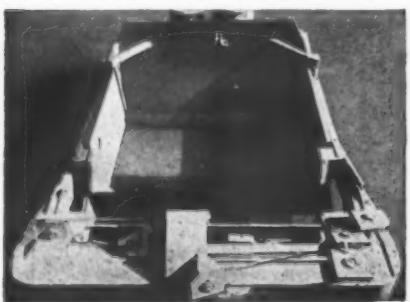
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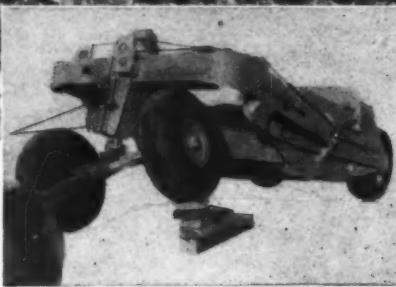
Carrimors* give you



• **THEY'RE "LOADING FOOLS"**—Bowed offset cutting edge insures instant penetration in all kinds of scraper material. Curved bottom and low, wide bowl also make it easy to get heaped loads in a hurry. Note generous apron opening for loading without any forward movement of rear gate.



• **OPEN TOP DESIGN**—Pioneered by LPC engineers, this popular feature eliminates overhead clearance worries, increases stability and simplifies loading with shovel or dragline when scraper is used for utility hauling and spreading.



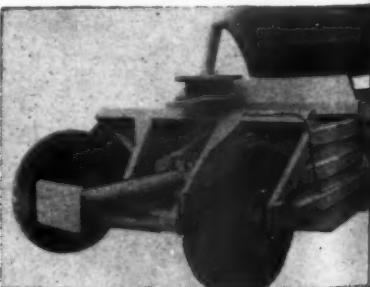
• **OSCILLATING FRONT WHEELS**—Provide ample clearance between front tires and frame, thus permitting "Carrimors" to load, haul and spread in almost any terrain, without damaging front tires.



• **CONTROLLED DIGGING**—A simple adjustment of the hoist cable enables you to get more dig from a level position—a big advantage when you're working low spots, cleaning ditches or digging stock ponds.



• **AMPLE CLEARANCE UNDER BOWL**—Enables LPC "Carrimors" to negotiate steep grades and rough ground without high centering. Low center of gravity, proper weight distribution and low over-all height mean greater stability.



• **RIGID GATE ALIGNMENT**—Three-point gate suspension on rollers maintains perfect alignment under all conditions. Center guide post also houses gate return spring and acts as buttress for pusher block.

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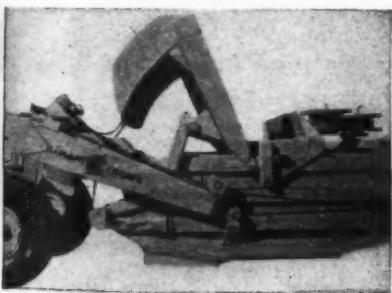
PROFITability!

When it comes to buying tractor-scaper rigs remember it's the scraper that makes the money. That's why hundreds of the nation's leading contractors are turning to job-proved LaPlant-Choate Carrimors—the scrapers that give you more production under all conditions and can prove it by competitive tests! Better get complete facts today from your nearest LPC distributor. LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Iowa; 1022 77th Avenue, Oakland, Calif.

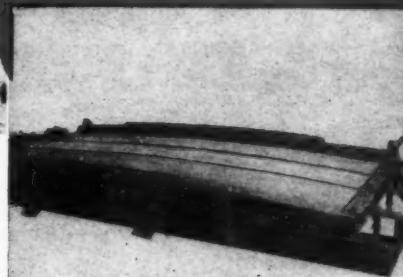
4 Reg. U. S. Pat. Off.



• **POSITIVE FORCED EJECTION** — Rear gate actually "bulldozes" all material out of the bowl, leaving the bottom and sides perfectly clean after every trip. Not only quicker and more positive but also permits using scraper as a rough grader.



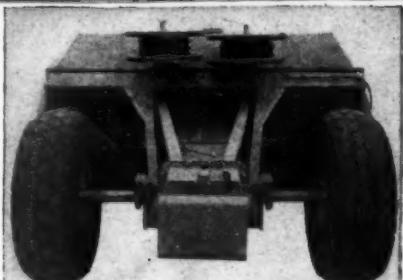
• **HIGH LIFTING FRONT APRON** — Note how LaPlant-Choate's patented linkage arrangement lifts the front apron ahead and out of the way. No chance of jamming sticky or bulky material between the rear gate and apron.



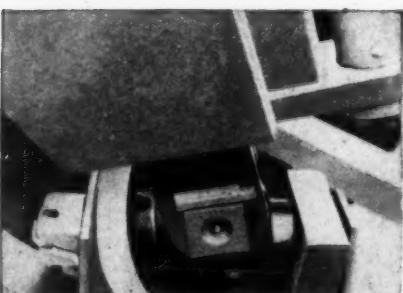
• **REINFORCED BOWL BOTTOM** — A 2" seasoned oak plank filler between the top and bottom plates lends extra strength to bowl bottom and helps prevent permanent deflection or denting by rocks, stumps, etc.



• **EASY TO SERVICE** — All moving parts on the new LPC "Carrimor" are easily accessible and are designed with standard grease gun fittings. In addition, wheel bearings are easily adjusted without removing the wheels.



• **STRONGER AND LIGHTER** — Use of outboard bearing suspensions of rear axles permits stronger design without excess deadweight and provides ample clearance for oversize tires where needed for extra flotation.



• **ADJUSTABLE KINGPIN ASSEMBLY** — Specially designed pin for taking up wear eliminates sloppy play and keeps vital kingpin assembly tight. Close-coupled universal action — lighter, stronger.

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in Moving Earth



Mobile tank-car heater available in two and three tank-car sizes. Oil-fired with exclusive design four-pass flue travel; dry-coil steam condensate return under pressure—no water or heat loss.



Portable pumping booster. Heats by direct firing in one operation, loading directly to distributor, relay truck or returning to tank-car. Available in 2 sizes—truck mounting or 4 wheel trailer.



Truck mounted pumping booster in service of Oklahoma Bituminous Distributing Co., Ada, Okla.



- ★ Most of the pioneer models of tank-car heaters, built by Cleaver-Brooks sixteen years ago, are still in service.
- ★ There are more Cleaver-Brooks tank car heaters and bituminous boosters in service than all other makes of similar equipment combined.
- ★ Service records from hundreds of owners prove Cleaver-Brooks dependability and durability. Cleaver-Brooks equipment is usually assigned to the difficult jobs—the hardest jobs—because of its known capacity and reliability.
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- ★ Cleaver-Brooks heaters are the "finished" product of the pioneers and originators of tank-car heaters and bituminous boosters—built by specialists in the construction of portable and stationary steam generators.

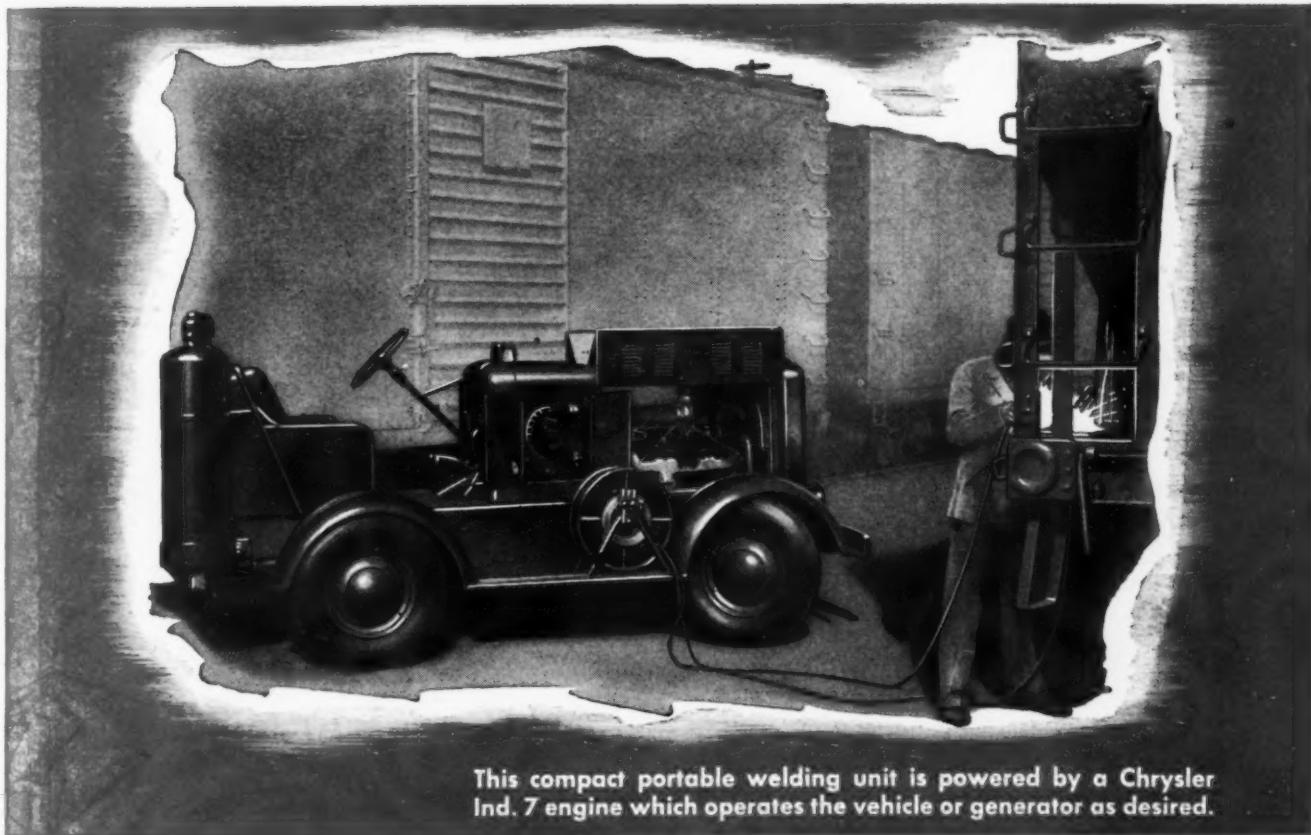
On your next bituminous heating equipment purchase you can expect to get more value from Cleaver-Brooks—qualified by experience and facilities in this specialized field.

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5106 N. 33rd St. Milwaukee 9, Wis.

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TANK CAR HEATERS . . . BITUMINOUS BOOSTERS . . . AUTOMATIC STEAM-PLANTS



This compact portable welding unit is powered by a Chrysler Ind. 7 engine which operates the vehicle or generator as desired.

Chrysler Industrial Engines Power a Wide Variety of Applications

Chrysler Industrial engines are chosen by many manufacturers of powered industrial equipment because they combine high compression flexible horsepower with compactness and low weight.

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Chrysler Industrial engines are "Pedigreed" horsepower. For more than 13 years they have delivered economical and dependable performance—out in the field where class tells.

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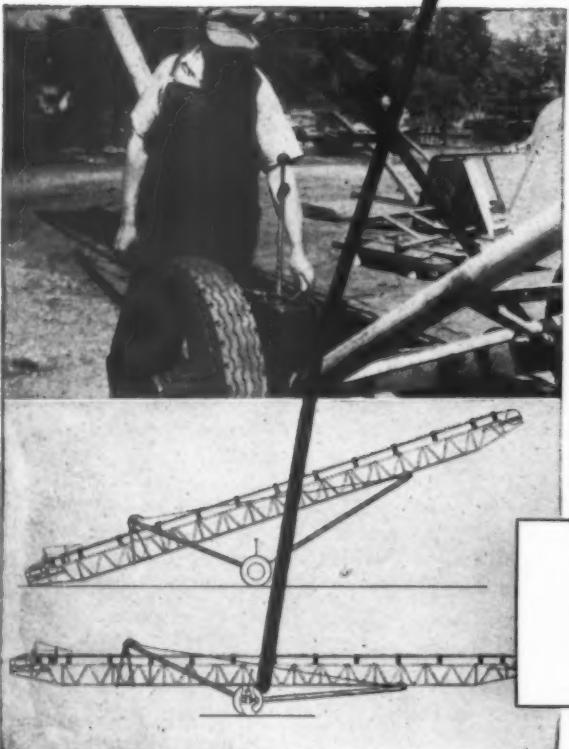
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Up again down again...

In less than 10 Minutes!



Moving conveyors from one job to the next used to take hours of valuable time, good men and equipment.

Now, it's a matter of minutes. One man can easily elevate a 60' conveyor in 9 minutes with the new *Pioneer* Hydraulic Conveyor Truck. A twist of a valve, and in 60 seconds the conveyor is back in its cradle . . . ready for another move.

Low overheads are no problem for this smooth rolling truck for it's *built without masts* and requires only 7'3" clearance.

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•A sturdy Blackhawk Pump boosts the conveyor into exact feeding position. Once spotted, it's locked securely in place. A low center of gravity, 8' tread, and pneumatic tires add to portability.

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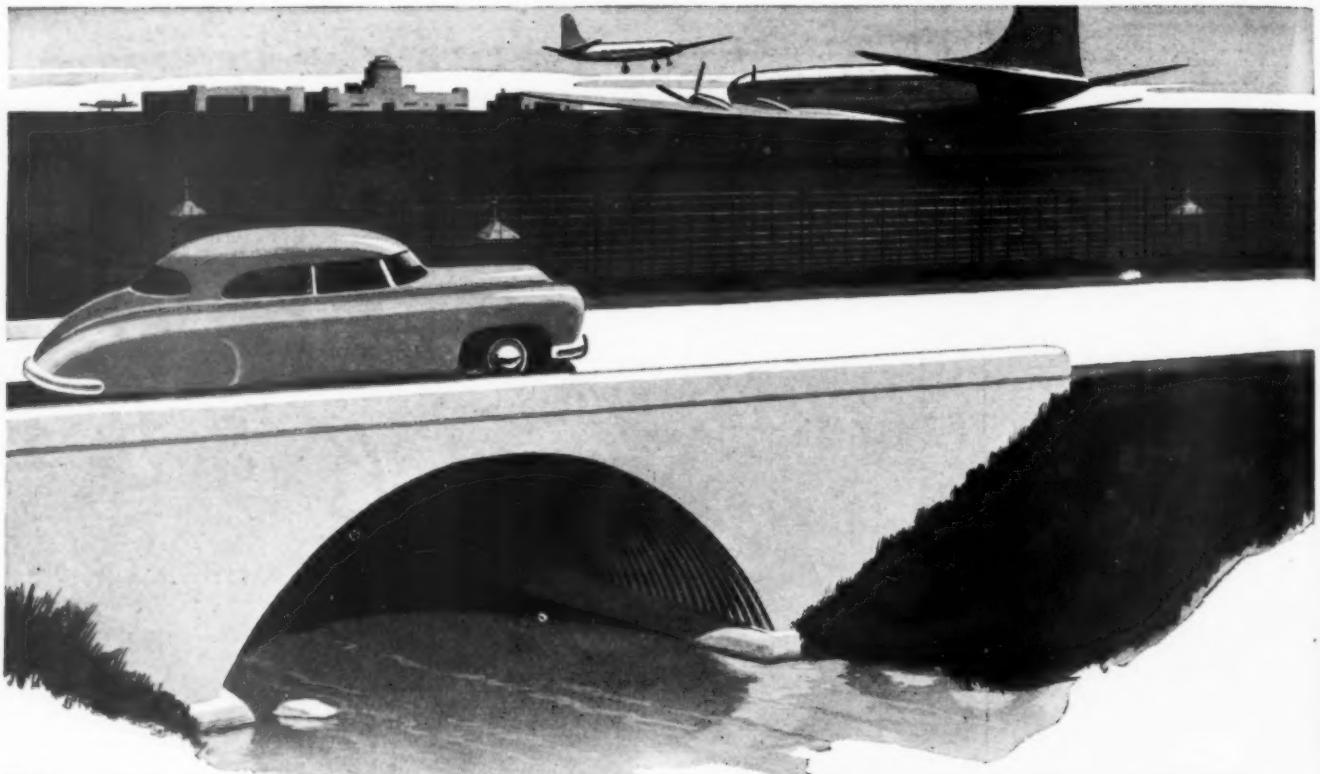


Good bucket performance means less time out for repairs and maintenance — constant pay loads on all kinds of digging and rehandling work — full utilization of crane capacities.

Catalog No. 1757 will tell you how to select the exact bucket for your job. Send for it.

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Years of satisfactory service, under the most severe conditions, have proved that drainage structures made of Toncan Iron are the best your money can buy. Here's why:

Toncan Iron is an alloy of highly refined open-hearth iron, with twice as much copper as is found in copper-bearing irons, *plus* molybdenum. As a consequence, Toncan Iron is the most highly rust-resistant ferrous metal in its price class. To further increase their rust-resistance, all Toncan Iron Drainage Products are galvanized. That's the reason drainage structures made from Toncan Iron can resist destructive rust caused by water, soil or sewage.

Drainage products made of Toncan Iron offer many other advantages. They are strong and flexible. This enables them to support tremendous loads and to withstand the impact, shock and vibration of moving traffic without cracking, splitting or crumbling. Toncan Iron Drainage Products are lightweight. This reduces freight, handling and hauling costs. Uncomplicated assembly assures fast erection on the job by common labor using simple tools.

Your Toncan Iron man will be glad to show you how Toncan Iron Drainage Products can be used to your best advantage.

Toncan Culvert Manufacturers' Association

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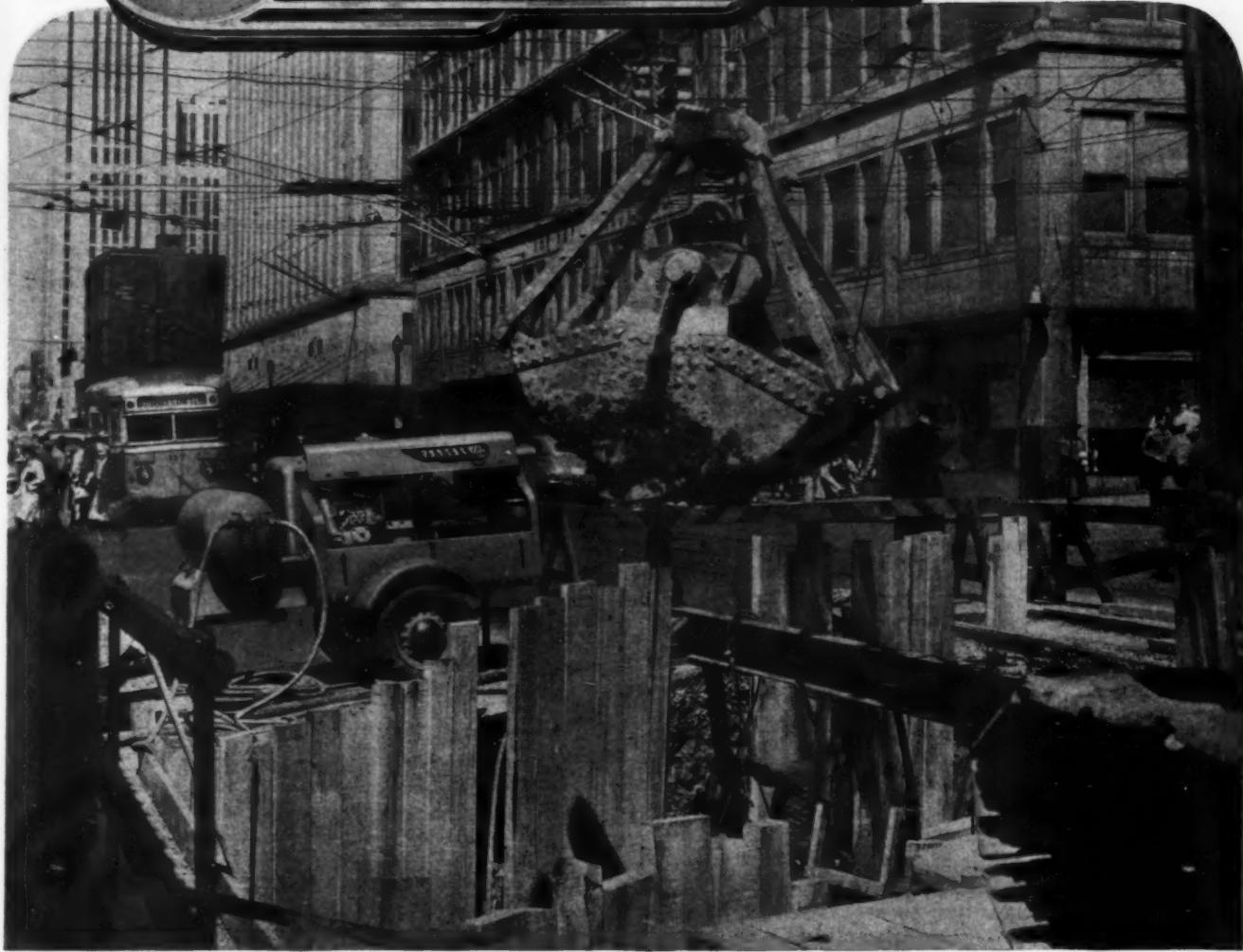
Toncan Iron . . . A product of Republic Steel Corporation

These Toncan Iron Drainage Products offer efficiency and economy:

CORRUGATED METAL PIPE • PERFORATED CORRUGATED METAL PIPE • CORRUGATED METAL PIPE ARCH • CORWEL SUBDRAINAGE PIPE
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JAEGER COMPRESSOR



No place for a horse-and-buggy compressor

That constant power-packed wallop of a Jaeger Compressor behind your tools makes a real difference when you're fighting time to save dollars and finish the job. Built to the same micro-precision as the latest Caterpillar, International and Continental engines which power them, these "AIR PLUS" units unfailingly deliver all the air that's called for, at cooler temperatures and with less cost in fuel and upkeep than any compressor you have ever owned.

Ask your Jaeger distributor or write us for Catalog JC-5, the up-to-date buyer's guide on air compressors from 60 to 500 cu. ft.

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Claims Are More Than Claims They're Backed By Proof Like

*Here are
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**MISSISSIPPI
WAGONS**

Check each of these statements against the owner report opposite . . . one of the many we have received testifying to the economy and versatility of Mississippi Wagons. Performance records like this are your guarantee that Mississippi Wagons have what it takes to handle your hauling jobs, at costs that will assure you of maximum profits.

1. Since the tractor is not subjected to the pounding and surging of the loaded trailer, a minimum of repairs are necessary during the life of the unit, resulting in more actual operating hours per month or year and in greatly decreased repair expense.
2. Repair parts are low in cost. The list price of all gears, bearings and shafts in the five-speed transmission is only \$188.99; of all wearing parts in the rear axle and differential, only \$315.95.
3. Short or long hauls, on or off the highway—it's all the same to versatile Mississippi Wagons.
4. The Mississippi Wagon is the only bottom-dump unit powered by a long-life industrial tractor that can haul payloads of 27,000 pounds over highways without exceeding the 18,000-pound axle-loading limit set by most state laws.
5. Mississippi Wagons provide greater flotation than semi-trailer units of the same capacity and will therefore travel over spongier ground. For the same reason, they will travel over black-top and other types of pavement without damage to the road surface.

M-R-S MANUFACTURING COMPANY, Jackson, Mississippi



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CONTRACTORS

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BATON ROUGE, LA.

September 12, 1945

Dunham-Pugh Company
Baton Rouge, Louisiana

Gentlemen:

I am pleased to give you the information requested on the four Mississippi Wagons we purchased from you on July 11, 1944.

During the first fourteen months we have owned these four Mississippi Wagons we have operated them approximately 3490 hours per unit with a repair parts bill of \$1099.87 on the tractors and \$181.65 on the trailers—a total of \$1281.52 for the four units, or \$320.38 for each unit.

In other words, our repair parts costs have been 9 and 18/100 cents an hour per unit, and the units are still in good operating condition, using about the same amount of fuel and oil they have always used.

During this fourteen months we have hauled the following quantities of material for the distances shown:

240,000 yards of dirt	average haul	1/2 mile
42,000 yards of gravel	average haul	8 miles
28,000 yards of gravel	average haul	10 miles
18,000 yards of shell	average haul	5 miles

We are now back on our dirt job at Lottie, Louisiana, finishing it up. Last winter's rains made it necessary for us to leave it as the ground conditions were quite bad, since the water level is only five feet underground on the job site.

It was very pleasing to us to have hauling equipment that permitted our taking contracts for gravel and shell hauling during those winter months, instead of having to scatter our organization and let our equipment stand idle.

In addition to their low maintenance cost and their suitability for both on or off the highway use, we are very pleased with the ability of our Mississippi Wagons to work under soft ground conditions, and with their ease of handling, operator comfort and simplicity.

I trust the above gives you all of the information requested.

Very truly yours,

MORRIS & YOUNG, CONTRACTORS

E. R. Morris

E. R. Morris

MISSISSIPPI WAGON

The World's Most Modern Hauling Unit



Why did old bridges carry umbrellas?

The covered bridges that once dotted the highways of the country weren't built to protect the traveler . . . but the bridge itself. By shielding the trusses, decking and stringers from moisture—which permits the fungus growth that causes decay—the life of the bridge was extended.

Today there is the same necessity

of protecting not only bridges, but all sorts of structures from the accelerated decay produced by moist conditions: building frames, roofs and walls in humid atmospheres; timbers and flooring laid at grade or sub-grade; piling and piers.

Koppers pressure treatments are available that give lasting, proven

protection against decay, termites and marine borers. Some resist acid attack, others confer fire-retardant properties. Our bulletin, "Economical and Permanent Construction with Pressure-Treated Wood" gives details. Ask for a complimentary copy. Wood Preserving Division, Koppers Company, Inc., Pittsburgh 19, Pa.





*Ask G.I. Joe
about*

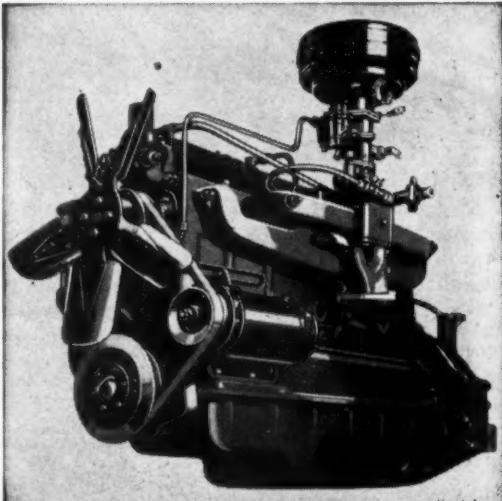
GMC RUGGED LONG LIFE

Returning Service Men regard GMC army trucks as the most rugged transport vehicles of the war. In GMC's fine war record there is plenty of reason for this belief.

GMCs of one Quartermaster Company rolled up a million miles . . . through the Pacific's swampy jungles, blinding dust and destructive tropical humidity . . . without one man-day lost due to motor mishap. GMCs stormed over the roads of Normandy, bumper to bumper, to help haul the 500,000 tons of supplies transported by the famous Red Ball Express. Other GMCs pulled tremendous loads over the mountains of Italy, the sands of Africa, the frozen tundras of Alaska.

You can look for similar rugged reliability in the GMC you buy for commercial use. For every GMC civilian model from $\frac{1}{2}$ to 20 tons has the same basic engine design as that which powered nearly 600,000 war-proved GMC trucks and "Ducks."

THE TRUCK OF VALUE

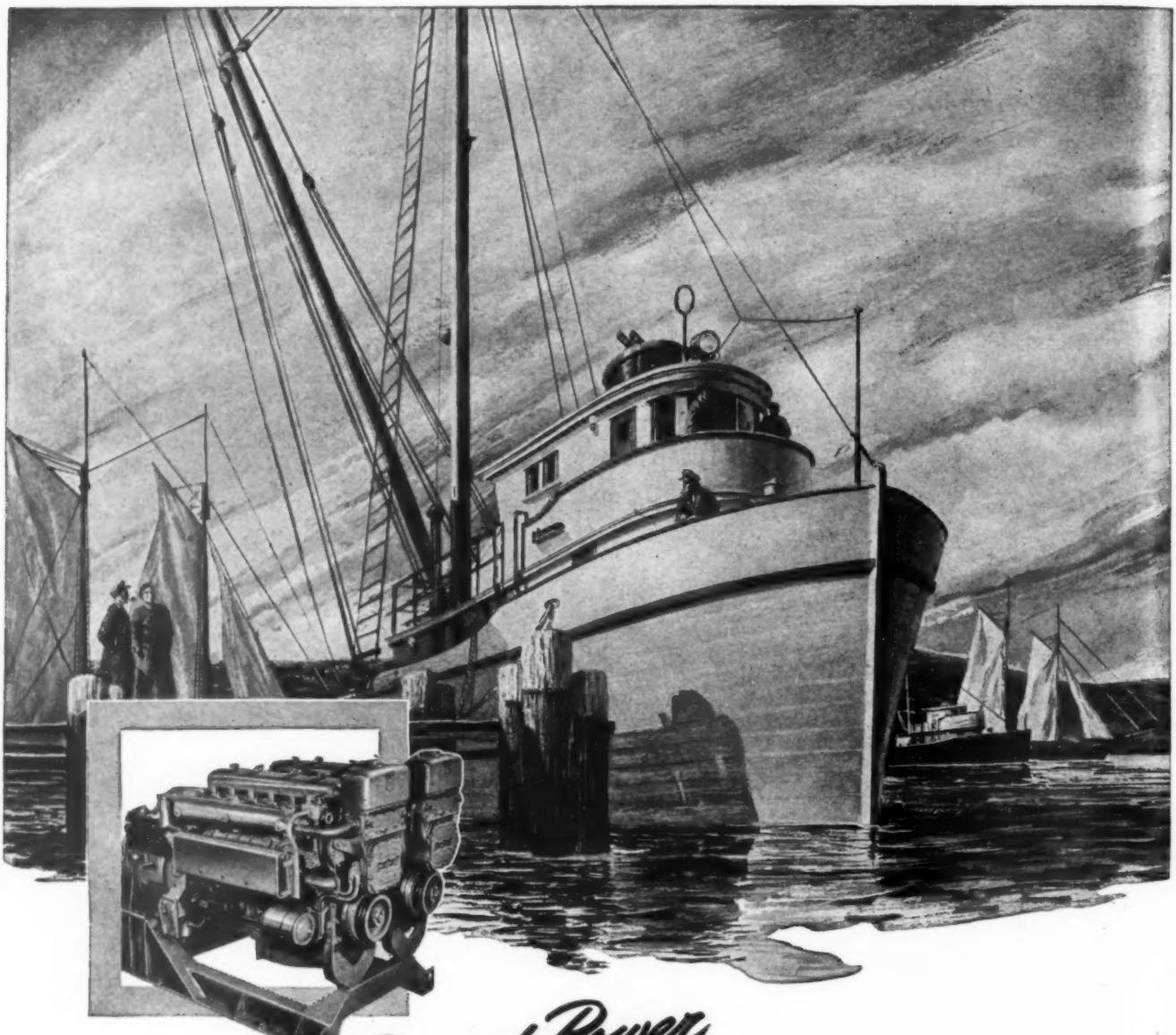


The famous "270" engine, power plant of the "Army's Workhorse," also powers GMC models in the 3-ton range. All other GMC gasoline engines are of the same basic, war-proved design.

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FISHERMEN make their money by getting back fast with the most fish and at the least cost. There's no profit in hauling around big, heavy engines that take up a lot of room.

So every day sees more and more General Motors Diesels going into fishing boats. And for good sound reasons.

These Diesels pack more power in less space—weigh less than older types. So *GM-powered boats carry more fish.*

GM Diesels get efficient combustion from low-cost fuel—keep going day after day with the least maintenance.

Add these features to the re-

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Whatever needs for power you may have in road-making machinery, cranes, shovels or any other construction equipment—look to GM Diesels.



Features of GM Diesels Important to Every User of Power

QUICK TO START on their own fuel

LOW COST—run on common fuel oil

EASY TO MAINTAIN—clean design plus accessibility

LESS FIRE HAZARD—no volatile explosive fuel

COMPACT—readily adaptable to any installation

SMOOTH OPERATION—rotating and reciprocating forces completely balanced

QUICK ACCELERATION—2-cycle principle produces power with every downward piston stroke

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GENERAL MOTORS

SINGLE ENGINES... Up to 200 H.P.

MULTIPLE UNITS... Up to 800 H.P.



FULL HAULPOWER*

Every Foot of the Way!

WALTER FOUR POINT POSITIVE DRIVE

Automatically Adapts Itself to Every Off-the-Road Condition

***HAULPOWER** means every horsepower at work—all the time—under all running conditions—not just when the going is good. Walter Tractor Trucks provide it in full measure—even when riding surfaces vary from wheel to wheel as they do in off-the-road hauling. The Walter Four Point Positive

Drive proportions the power to the FOUR driving wheels according to their traction at any instant. Full tractive effort is maintained even though running conditions range from deep mud, loose dirt, slippery grass, rocks or snow, to steep grades.

● You can haul bigger loads with Walter Tractor Trucks because you are not handicapped by a drive system that loses traction when surface conditions change. Their greater capacity and speed in off-the-road hauling enable you to use fewer trucks. This reduces congestion at loading and unloading points, speeds work, cuts fuel, oil and servicing charges.

Walter Tractor Trucks are engineered throughout for off-the-road hauling. The Suspended Double Reduction Drive protects vital parts from high crowns and stumps, increases gear capacity, reduces unsprung weight. Tractor Type

Transmission affords ample gear ratios for any emergency.

Engine ahead of wheels shortens turning radius and correctly distributes weight. Choice of engines from 125 to 300 h.p. Write for detailed description.

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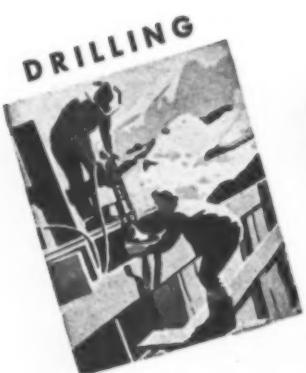
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Knocking hours off schedule, cutting operating costs—that's what Barco Hammers are doing in every section of the country. Contractors like their speed and economy, workmen like their light weight, easy operation — their efficiency under tough conditions at hard-to-reach spots. And for versatility, Barco has eleven special tool attachments, each instantly interchangeable. Write to Barco Manufacturing Co., Not Inc., 1815 Winnemac Avenue, Chicago 40, Illinois.



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Portable Gasoline HAMMERS

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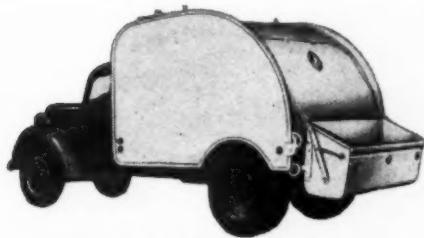
For years Gar Wood has consistently offered truck and trailer equipment of utmost utility and outstanding value. Leadership in this field resulted from this policy. Gar Wood equipment costs less in the long run because it is better built to give peak performance and lasting satisfaction.



The Load Packer (patented) all enclosed garbage and refuse unit. Compresses loads hydraulically for maximum payloads.



Type C28 scow end Garbage Body. Steel hinged covers extra equipment.



The new Bucket Loader, an all enclosed sanitary refuse disposal unit.



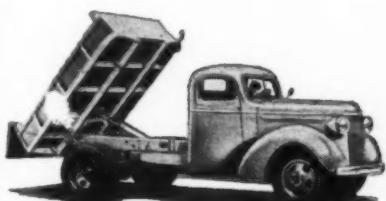
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Type C50 Garbage Body with sliding steel covers on each side.



Model "QD" Tree-moving Crane. Easily erected or removed from all purpose stake body.



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Telescopic boom Crane. Boom radius 8 to 20 feet.



Special W28 Garbage Body, watertight top box. Capacity 7 cu. yds. Type T333 telescopic Hoist.



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CECO'S 3-POINT PROGRAM for surer, bigger road building profits

HERE IS A 3-POINT SERVICE THAT CAN BE A REAL WINNER FOR YOU

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Your whole operation is streamlined. In one complete order you can specify everything you need. You get your materials where you want them . . . when you want them.

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Say good-bye to guesswork bidding. Ceco supplies you with accurate data. You can bid to get the job . . . and bid to make money on it.

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Ceco Engineers do your detail work. They supply you with blueprints on reinforcing and other materials . . . help make your construction job easier.

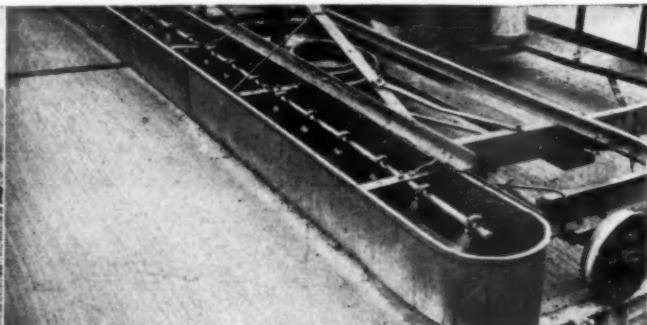
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CECO ENGINEERING + CONSTRUCTION KNOW-HOW

Ceco Road Building Materials are engineered to a quality and precision that makes construction worry-free. But there's more than that. Ceco Engineers have years of practical construction experience behind them. All that wealth of know-how is yours. Call any one of 23 offices, strategically located coast to coast. You can always depend on Ceco.



Welded Fabric, electrically welded at intersections, makes ideal reinforcing.



Cecure Applicator gives positive, even application of Cecure compound.

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HIGHWAY PRODUCTS DIVISION
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*In construction products **CECO ENGINEERING** makes the big difference*

The GALION 102 "Keeps its wheels on the ground"



13,550 lbs.

BLADE PRESSURE!

That's more than enough to easily handle your toughest road construction job.

* 23,900 lbs.
of **ENGINEERED Weight!**

*TOTAL WEIGHT WITH SCARIFIER

But weight is not put on the New Galion 102 Grader just for the sake of weight—every pound on the 102 serves an important purpose—and this weight is so *engineered* into the design that fully 65-70% of it is placed over the rear wheels where it adds greatly to the effectiveness of Galion's famed tractive power.

This proper distribution of weight means that it is not necessary to add calcium chloride or other dead weights in the rear tires to secure sufficient tractive power. The Galion 102 really "keeps its wheels on the ground," its blade biting in, and moves relentlessly forward until the job is finished.

YOUR GALION DISTRIBUTOR WILL DEMONSTRATE IT FOR YOU

You owe it to yourself to contact the nearest Galion Distributor and arrange for a demonstration. Get up in the operator's seat, try it yourself—and you'll never be satisfied until you own a Galion 102. Catalog No. 290 describes in detail the many advanced operating features of the Galion 102—write for a copy today.

**The GALION IRON WORKS &
MANUFACTURING COMPANY**

*General and Export Sales Offices
Galion, Ohio, U. S. A.*

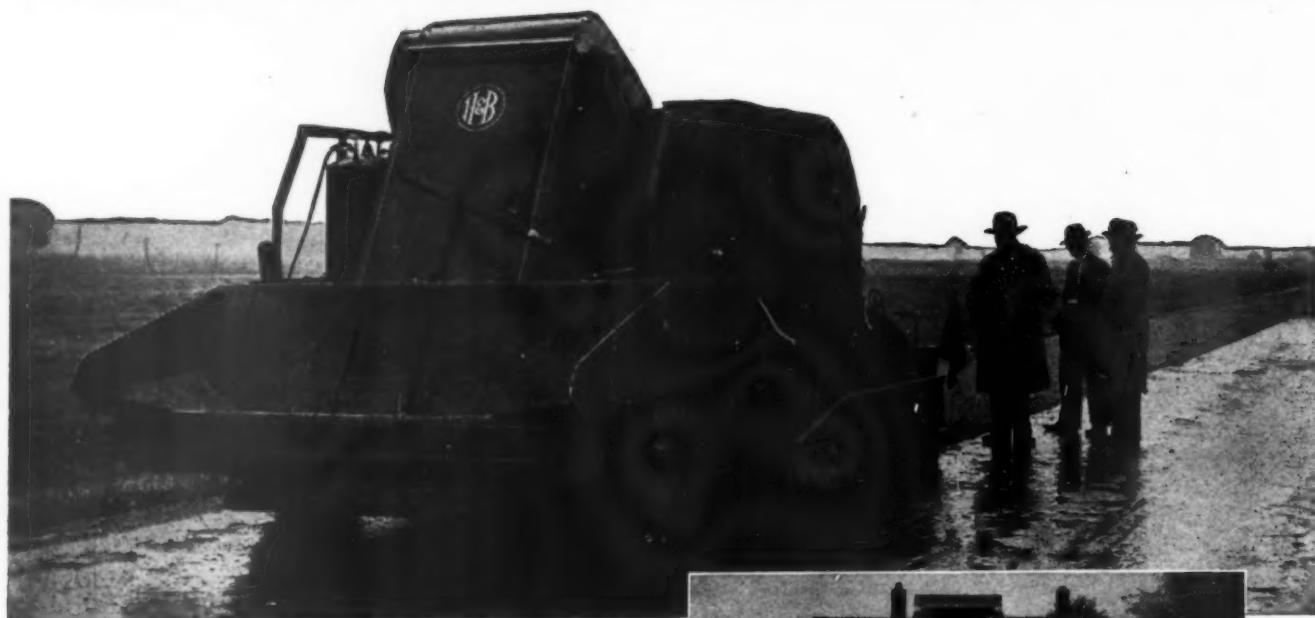
GALION IRON WORKS

GRADERS • ROLLERS



Moto-Paver

THE COMPLETE TRAVELING MIXER AND PAVER

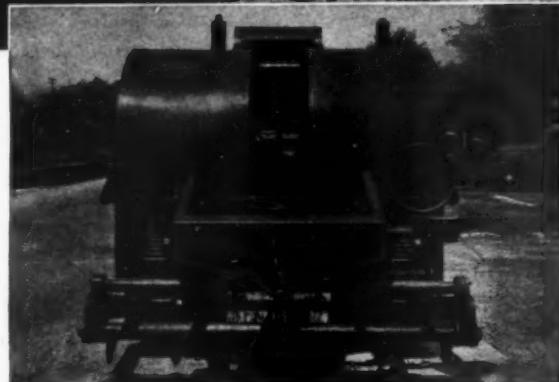


- ★ SELF-CONTAINED ★ SELF-PROPELLED
- ★ MIXING CAPACITY 100 TO 120 TONS PER HOUR
- ★ PAVING SPEED 4 TO 50 FT. PER MIN.
- ★ ROAD SPEED UP TO 18 MILES PER HOUR

MIXES, SPREADS AND LAYS ANY TYPE OF MIXED-IN-PLACE BITUMINOUS MATERIAL TO ANY ROAD WIDTH, THICKNESS AND CROWN CONDITION

The Moto-Paver does the *complete mixing and paving job*. No separate loader or spreader is required—no trailer to haul the machine from one job to another.

This highly flexible mobile plant is especially adapted for resurfacing work on county roads and city streets, because of the different



Rear view, with strike-off bar removed to show the patented spreading arrangement and controls

types of pavement that can be produced with it, and because it can be quickly moved from one job to another under its own power. The Moto-Paver is also highly efficient on new construction.

Bulletin MP-46, giving complete information and specifications, will be sent on request.

HETHERINGTON & BERNER INC. • 721 KENTUCKY AVENUE, INDIANAPOLIS 7, INDIANA

Hetherington & Berner



BUILDERS OF PORTABLE AND STATIONARY ASPHALT PLANTS OF ALL TYPES AND CAPACITIES

FROM START . . . TO FINISH !



These are some of the features that play a part in the "Start to Finish" Hanson design:

Air Controlled Steering . . . All welded steel construction . . . Timken Roller Bearings at all vital points . . . Chain crowd . . . Full revolving . . . Low center of gravity . . . Special Hanson clutches, easily adjusted and relined without dismantling shafts . . . Extra long crawlers . . . Heavy duty industrial type gasoline or diesel motors. Quickly convertible to Crane (4½ and 6½ ton), Dragline, Clamshell or Trench-hoe.

Includes a lot of territory, to be sure, especially when you're talking about the design and construction of a huge unit such as this Hanson Model 41 Excavator.

The Hanson Company's insistence on high quality starts with drawing board design. It carries right on through the purchase and specifications of materials and parts. During the machining and assembly of parts the employees at Hanson have caught the spirit of "It's got to be right"!

Little wonder that Hanson owners and operators have only praise for this equipment. They enjoy the ultimate benefits of the "Start to Finish" quality which really adds up in on-the-job performance. The Excavator comes in two sizes: 3/8 yd. and 1/2 yd. A more intimate picture of Hanson Excavator features and construction is yours for the asking.

Write for the latest catalog RS-86.

Other Hanson products which have this characteristic "Start to Finish" quality are: Yard & Dock Cranes, Truck Shovels, Heavy Duty Machinery Trailers. Write for more information on any of these, indicating the equipment in which you are interested.

HANSON

CLUTCH AND MACHINERY
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EXTRA-DUTY OIL for



SINCLAIR
OPALINE
TBT MOTOR OIL

Made especially
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EXTRA-DUTY SERVICE

Equipment operating under *unusual* service conditions needs an *unusual extra-duty* motor oil for top performance efficiency.

Sinclair *Opaline TBT Motor Oil* is made for sustained load, high temperature operation. Fortifying additives, to supplement special refinery treatment, are used in TBT to combat oxidation, bearing corrosion, and foaming. Detergent dispersal qualities tend to keep engines clean and free from varnish and carbonaceous deposits.

Opaline TBT Motor Oil is available in grades to suit varied engine designs and operating requirements. Try this *extra-duty* oil for *extra-duty* gasoline engine service. Use Sinclair Tenol for Diesel equipment.

SINCLAIR AUTOMOTIVE OILS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N.Y.



On the Sea Coast
THIS WARNING LIGHT



FLASHES BOTH FRONT AND REAR

ON YOUR MOTORIZED VEHICLES THIS "LIGHTHOUSE OF THE HIGHWAY"

► LIVES may be saved—accidents prevented—by installing Keystone Safety Lights on all your highway equipment.

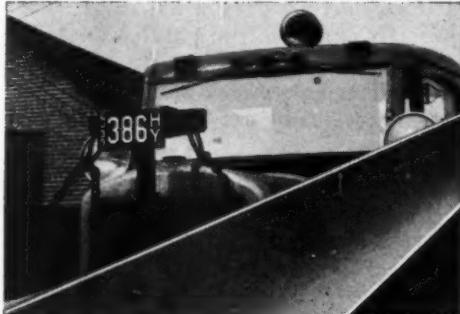
Mounted on top of the vehicle's cab, this light flashes 80 storm-piercing "STOP" warnings per minute—both to front and rear. It can be seen in weather that blots out other lights. Acts as a "lighthouse" to promote highway safety.

Used in all snow states on highway plows and by countless cities, counties, towns, park and highway commissions, public utilities, etc., on all types of vehicles. Write on your official stationery requesting sample light for inspection. Immediate deliveries. Auto Gear & Parts Co., 16th St. & Hunting Park Ave., Philadelphia 40, Pa.

The "Lighthouse of the Highway"

KEYSTONE SAFETY LIGHT

When writing advertisers please mention → ROADS AND STREETS, August, 1946



This vibration and weatherproof light is supplied with 6½" red lenses, lettered "STOP"; or with plain red, amber or blue lenses, for 6 or 12 volt systems.

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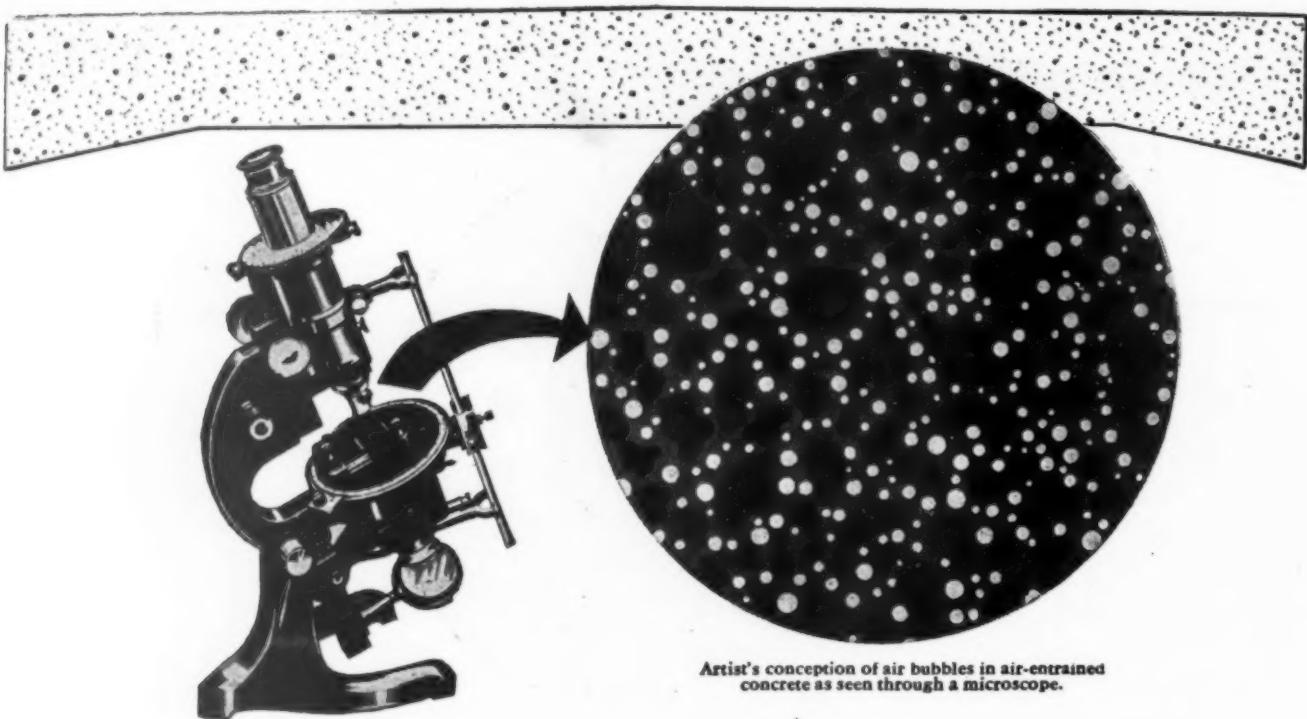
Auto Gear & Parts Co.,
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Send literature describing your warning light.

Quote price on Keystone Safety Lights for —6 volt (or —12 volt) systems.

Name

Address



Artist's conception of air bubbles in air-entrained concrete as seen through a microscope.

AIR BUBBLES IN CONCRETE

Millions of minute, disconnected air bubbles trapped in concrete by using a new product,

AIR-ENTRAINING PORTLAND CEMENT

is the answer of research to the problem of concrete pavement scaling.

The repeated use of concentrated calcium chloride and common salt to melt ice and snow on main traveled highways and streets, (a relatively new and largely wartime expedient), has caused unsightly scaling of well-constructed concrete pavements. Impaired riding qualities and increased maintenance have often resulted.

To conserve the public's investment in existing concrete pavements, the *careless* use of such concentrated chemicals should be avoided. If chloride salts are to be used for ice control, the pavements

should receive a protective treatment *developed by research* and the chemicals should be used *intelligently and sparingly*.

For future pavements, the protection should be *built in the concrete* by using

AIR-ENTRAINING PORTLAND CEMENT

Send for bulletins, "Elimination of Pavement Scaling by Use of Air-Entraining Portland Cement," and "Protection of Existing Concrete Pavements from Salt and Calcium Chloride." Free in United States and Canada.

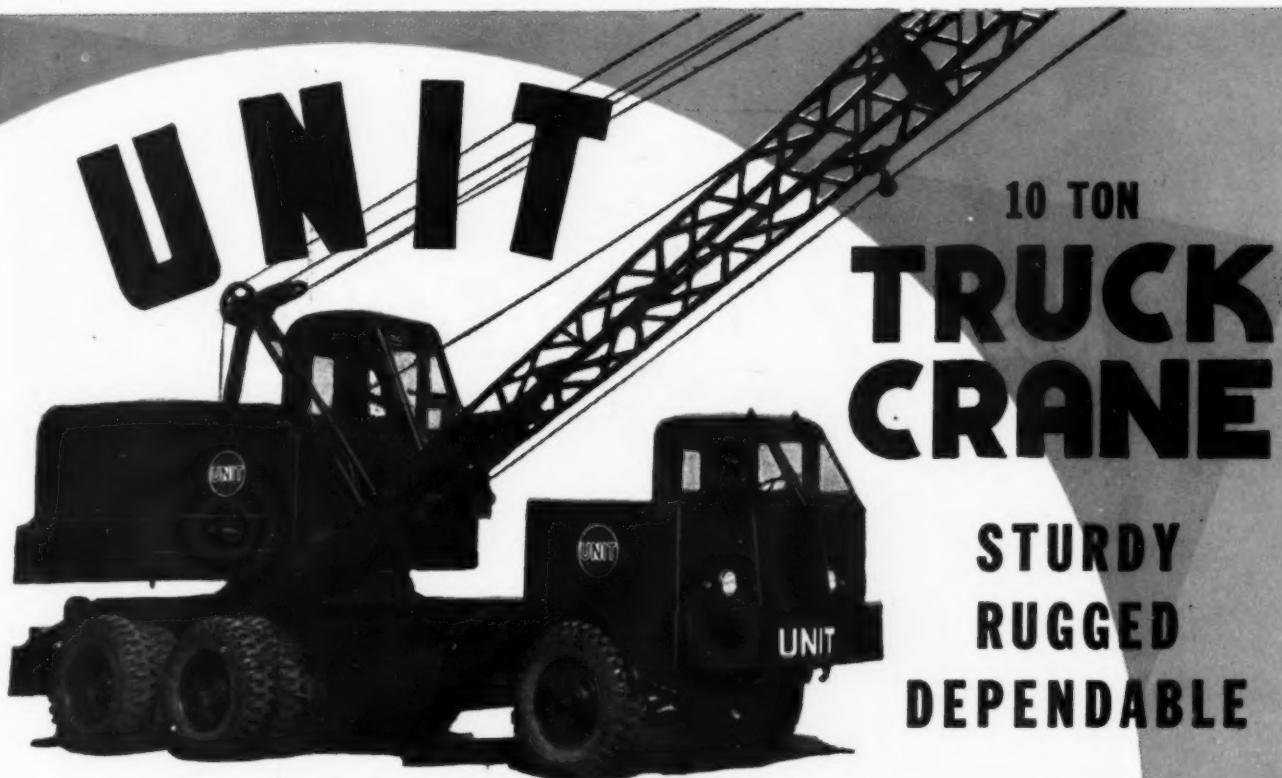
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A national organization to improve and extend the uses of concrete
...through scientific research and engineering field work



Air-entraining portland cement was used in the 10-in. concrete slab on the Davison Limited Access Highway in Detroit



READY FOR ACTION!

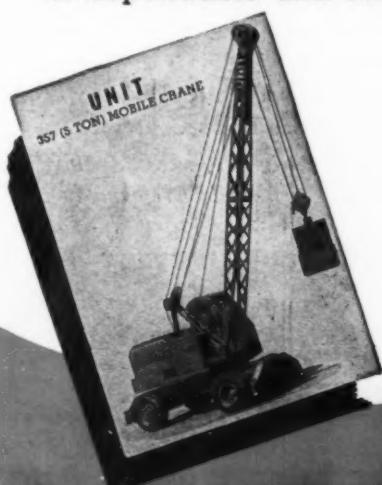
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5 to 10 Ton Cranes Com-
patible to ALL Attachments.

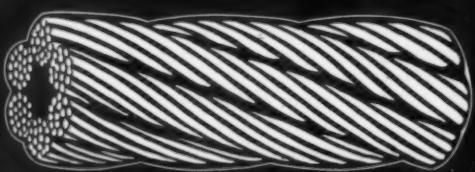
UNIT CRANE & SHOVEL CORP. MILWAUKEE 14,
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Resists Abrasion Better...



UPSON-WALTON LANG LAY ROPE



U-W Lang Lay (in which, unlike other types of wire rope, the wires and strands are twisted in the *same* direction) offers many advantages to many users.

For dragline excavators . . . shovels . . . slope haulages and inclines; for backfillers, slushers, carryall scrapers, and traction ropes on aerial tramways—wherever there are severe abrasion conditions and wherever exceptionally good flexibility and maximum resistance to bending fatigue are necessary, U-W Lang Lay rope can be counted upon to do the best job.

Lang Lay provides the greatest resistance to abrasion because the outer wires have a much greater wearing surface—*almost three times as much as regular lay!* This, in turn, provides greater metallic bearing which reduces wear on sheaves and drums as well as on the rope itself. It should, however, in almost all cases be *Pre-formed* to prevent untwisting and provide longer service at lower operating cost.

U-W Lang Lay ropes are available with hemp center or IWRC (Independent Wire Rope Center).

For best service where wear is hardest, specify *U-W Lang Lay, Perfection Grade, Layrite Preformed*.



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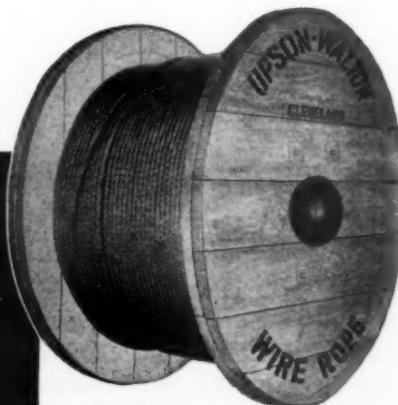
Manufacturers of *Wire Rope, Wire Rope Fittings, Tackle Blocks*

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FWD THE *One* TRUCK FOR *Many* JOBS



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Wherever highway construction and maintenance men operate, the outstanding ability of FWD trucks with under-body blade equipment is well known and valued. On their blading ability alone, FWDs rate as first choice for highway duty . . . but the same truck that does this work so well does scores of other highway jobs equally well, throughout all seasons of the year.

Back of FWD superior performance is the experienced, specialized FWD engineering that provides the highest development of the true four-wheel-drive principle with center differential . . . engineering that equalizes power and load distribution, puts driving power and traction on all wheels, divides working-strains over two driving axles . . . engineering that gives FWDs the power, ruggedness, dependability and economy that makes these all-purpose trucks the first choice of highway authorities.

See your FWD dealer, or write for information on FWD trucks now ready to go to work for you.



There was genuine pride in the voice of driver Bob McBride as he told the FWD photographer "I sure do like that truck!" It's the newest and biggest of the Logan County, Colorado, Highway Department's fleet. For 15 years Logan County has used every one of its FWDs to do many jobs, from grading and weed removal to heavy snow clearing.

THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis., U.S.A.

Canadian Factory: KITCHENER, ONTARIO

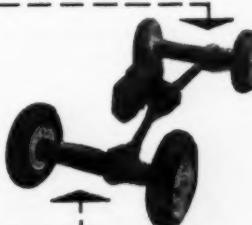


THE ORIGINAL EXCLUSIVE BUILDERS
OF FOUR-WHEEL-DRIVE TRUCKS

FOUR-WHEEL-DRIVE

A "plus" that pays in many ways

"MORE POWER ON MORE WHEELS"



Down-to-Earth Engineering



Cable Dozer



Heavy-Duty Cable Grader



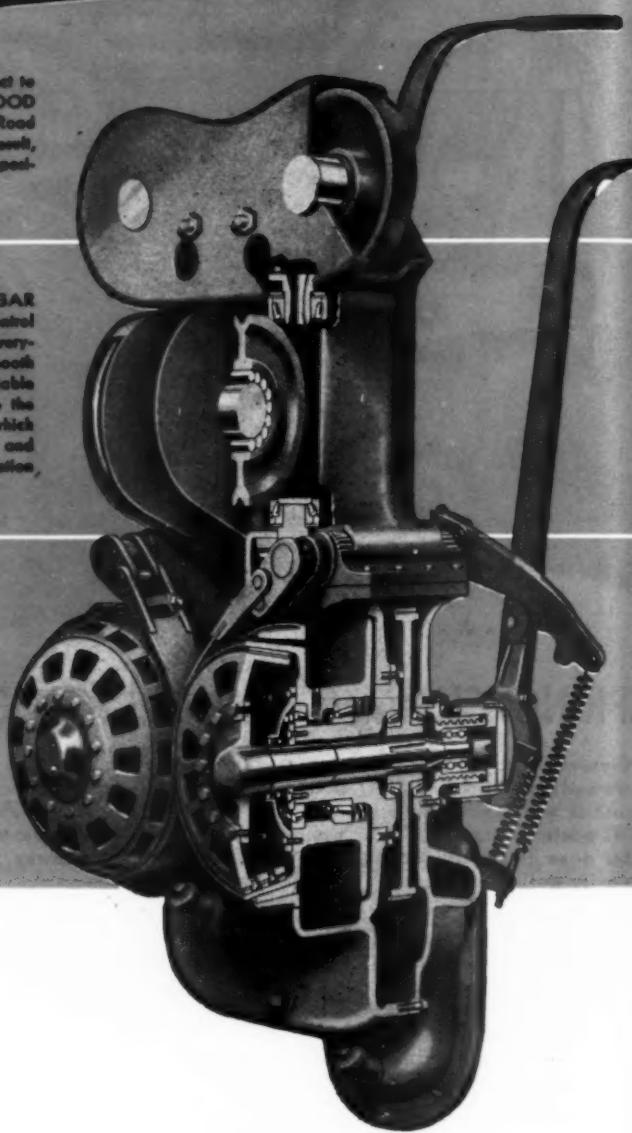
2-Wheel Cable Scraper

**GAR WOOD Cable Controls Feature
Rugged Simplicity and Direct Action Pull**

The cable goes direct to the job in GAR WOOD Cable-Controlled Road Machinery. As a result, it has fast action, positively controlled.

The job-proved GAR WOOD Cable Control Unit (right) has everything it takes for smooth operation and reliable performance. Note the sturdy steel housing which prevents distortion and serves as a lubrication chamber.

Outside clutches and servo-type, self-energizing brakes cool themselves and are readily accessible. Roller bearings throughout and spur-type gears keep adjustments at a minimum.



PROVED through the years on the toughest of jobs. Made more rugged than ever by the lessons learned in war action on every front, from Guadalcanal to Okinawa and from Oran to Berlin.

GAR WOOD Road Machinery and the famous GAR WOOD Cable Control Power Unit offers practical design and sound construction, well engineered and honestly built—equipment that holds together and can be operated with an absolute minimum of down time. *If it's GAR WOOD, it's good.*

See your Allis-Chalmers dealer. He'll be happy to give you all the facts and show you Gar Wood Earth Moving Equipment *on the job* in your own vicinity.



Gar Wood 2-Wheel Hydraulic Scraper and Bulldozer



Gar Wood Hydraulic Dozer

OTHER GAR WOOD PRODUCTS: HOISTS AND BODIES • TANKS •
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ROAD MACHINERY**
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How to cut the nation's garage bill by \$93,600,000.00



A study of midwestern highways reveals that it costs \$0.0078 a mile *more* to drive your automobile over unsurfaced roads. To every farmer who averages *only* 2,000 miles a year over dirt roads, that means \$15.60 **MORE** in car upkeep. That amounts to \$93,600,000 for the 6,000,000 farmers in the land.

There is an extensive program getting under way to improve the highway systems throughout the nation. What plans are you making to improve the road net-



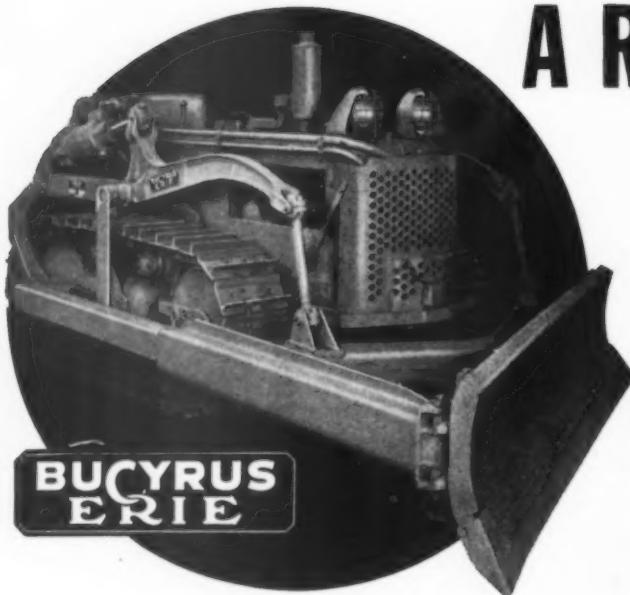
works serving your state, county, or your community?

Many highway departments are utilizing Tarmac construction . . . providing durable smooth riding surfaces for main highways and secondary roads alike . . . utilizing local manpower and local aggregates or soil stabilized bases. This type of construction also provides an economical method of resurfacing and maintaining existing roads.



KOPPERS COMPANY, INC.

Tar and Chemical Division, Pittsburgh 19, Pa.



A REAL DIGGING TOOL THAT'S EASY ON THE TRACTOR

Bucyrus-Erie Bullgrader-International TracTractor combinations are powerful, economical dirt-moving teams—powerful because the Bullgrader applies the power of this tractor most efficiently; economical because the Bullgrader safeguards the tractor from undue wear and maintenance.

Here are the specific reasons why every Bull-

grader, designed and built exclusively for International TracTractors, permits its owner to take full advantage of tractor power; here are reasons, too, why maintenance is so low:

1 ORIGINAL TRACTOR BALANCE IS MAINTAINED

The Bullgrader is mounted to the TracTractor in such a way that its balance point is not affected. This enables the tractor to do the work for which it is designed, lets it travel both forward and backward without tipping. It means that you get the full tractive effort of the track belt. Track roller loads are distributed evenly. Excessive wear and strain on front track idlers and rollers is eliminated.

2 LOADS ARE APPLIED AT THE PLACES DESIGNED TO TAKE THEM

The main frame of the Bullgrader is attached to the tractor at the point of rotation of the tractor tracks, so that digging thrusts are carried directly to pivots on the rear support brackets. All superstructures are mounted on the track frame, relieving the tractor main frame, engine, transmission case, final drive housing, etc., of damaging stress and shock loads.

Let your International TracTractor Distributor show you these features. Be sure to ask him about other Bullgrader features, too: hydraulic control that gives you positive digging down pressure, scientifically curved blade, quick angling and tilting, unobstructed vision.

13T45

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See Your
**INTERNATIONAL
TRACTOR
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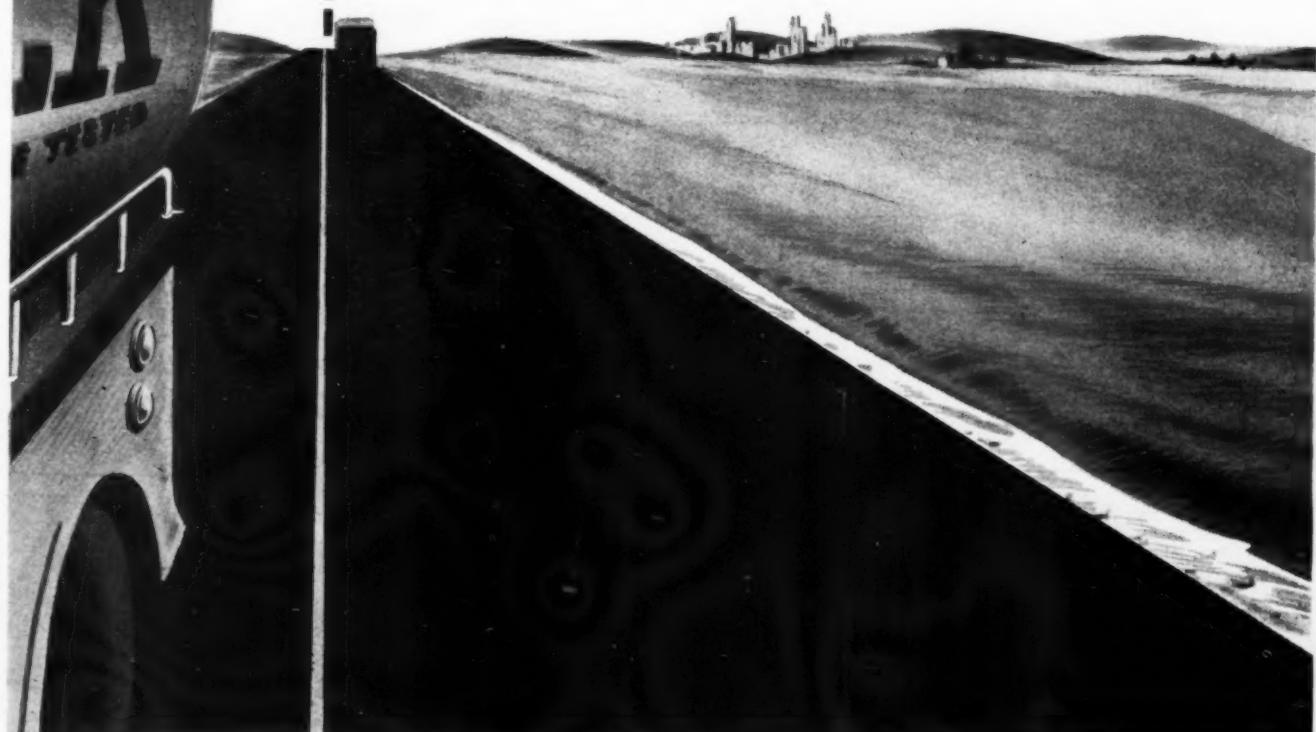
Underneath it all for over 20 years . . . better roads built with Ohio Oil Company Asphalts

Underneath heavier traffic and increasing loads for over 20 years, Ohio Oil Company Asphalts have earned a place on top with Midwest contractors and public officials. For roads built with Ohio Oil Asphalts maintain consistent records for long life, economy, minimum repairs. The Ohio Oil Company manufactures a complete line of all grades of rapid, medium and slow-curing asphalts and asphalt cements and Lincoln-ite (pulverized petroleum asphalt).

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Producers of Petroleum since 1887



Diesel Engine **DANGER** points

Alloy bearings corroded by unstable lubricants

The high pressures and temperatures in present-day Diesel engines greatly accelerate oxidation of some lubricants. Under such conditions, these oils tend to become corrosive and attack the lead in the copper-lead structure of alloy bearings. This leaves a porous copper shell which breaks down under pressure. The illustration shows how an alloy bearing looks after operation with an uncompounded oil.



RPM DELO Oil gives bearings 3-way protection against corrosion

1. RPM DELO Diesel Engine Lubricating Oil base stocks are naturally resistant to oxidation, the cause of most lubricants becoming corrosive.
2. RPM DELO Oil is compounded to further reduce the danger of oxidation.
3. RPM DELO Oil's oxidation inhibitor gives bearings direct protection against corrosion.

In addition, RPM DELO Oil is compounded to prevent ring-sticking, to reduce wear by clinging to high-temperature areas most oils leave bare, to eliminate foaming.

To match the fine performance of RPM DELO OIL, use these equally efficient companion products from the same famous "RPM" line—RPM HEAVY DUTY MOTOR OIL—RPM COMPOUNDED MOTOR OIL—RPM GEAR OILS AND LUBRICANTS—RPM GREASES. For additional information or name of your distributor, write any of the companies below:

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America's finest Highways are reinforced with **TRUSCON WELDED STEEL FABRIC**

Everywhere across the country—up in the mountains, down in the valleys, along the seaside—mile after mile of America's finest concrete highways are reinforced with Truscon Welded Steel Fabric.

These highways can be depended upon to provide long, economical life because Truscon Welded Steel Fabric offers these advantages to concrete:

Provides resistance to cracking due to shrinkage of concrete during setting period.

Provides tensile strength necessary to resist subgrade friction caused by expansion and contraction of the concrete slab.

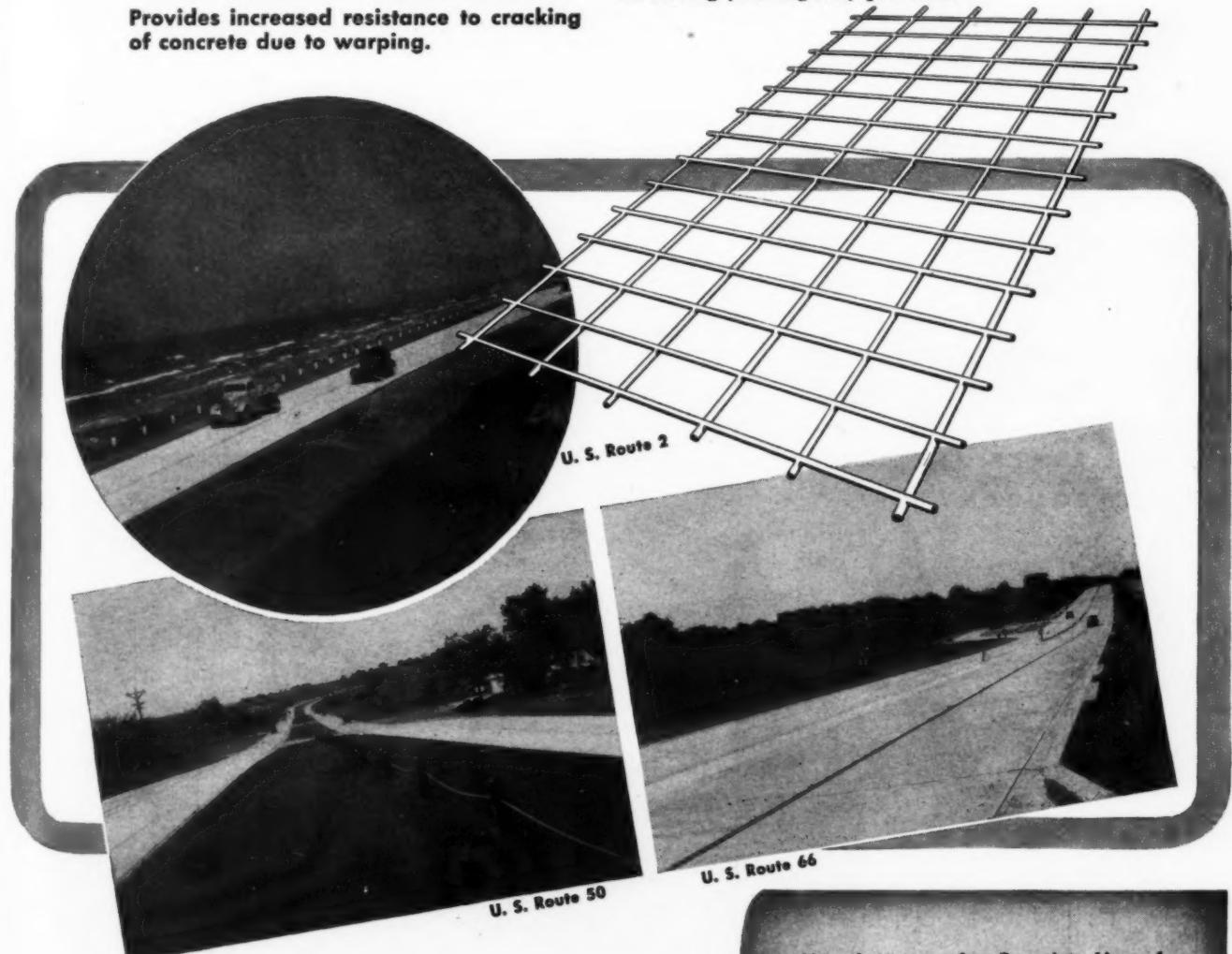
Provides increased resistance to cracking of concrete due to warping.

Provides resistance to the development of microscopic cracks into visible cracks.

Provides resistance to cracks opening and allowing entrance of water.

Provides resistance to broken ends of slabs separating at a crack.

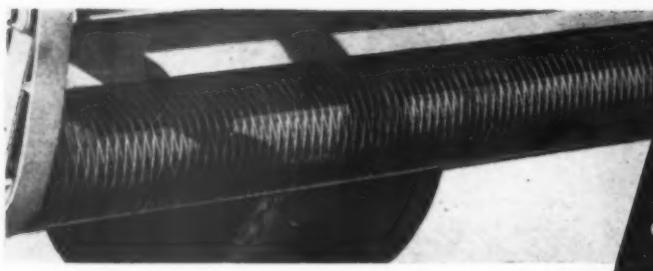
For strong, durable highways, plan to use Truscon Welded Steel Fabric and associated road building products. That way you can be sure of smooth, durable roads which will better serve your community and increase your prestige. An experienced Truscon highway engineer will be glad to assist you in solving your highway problems.



TRUSCON STEEL COMPANY
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Manufacturers of a Complete Line of
Welded Steel Fabric . . . Concrete Bars,
. . . Contraction Joints . . . Dowel As-
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TOMORROW'S WAY.. *Is yours Today!*

Spiral feed roll grips material—assures positive distribution



Provides accurate spread—from a trickle to a heavy flow



Large spreader box has simple adjustments for all widths



Saves up to 51% in labor and up to 20% in material



Handles wet or dry materials from sand to 1" stone



Easily adjusted for taper spreading



Spreads close to obstructions



**BUCKEYE TRACTION
DITCHER COMPANY
FINDLAY, OHIO**

BUCKEYE MATERIAL SPREADERS

Check the design and construction of Buckeye Spreaders and you will agree that they are *ahead*—tomorrow's equipment for today's jobs. They spread materials faster, more accurately and with maximum economy. Here's why:

Buckeye Spreaders provide accurate, even distribution of material in a single pass. It's just like unrolling a carpet. There are no patches to go over—no brooming or raking—no edges to line up—no low spots to fill.

It puts the material where you want it—thick on one side and thin on the other or even depth all the way across.

Simplicity of operation is a widely appreciated feature of Buckeye Spreaders. Easy to hitch—easy to load—easy to blockout for narrow sections. Speed up your truck and you speed up your spreading.

Check on the many advantages of Buckeye Spreaders that save time, labor, and cut loss of yield to a bare minimum. Your Buckeye dealer can give you complete details.



built by **Buckeye**

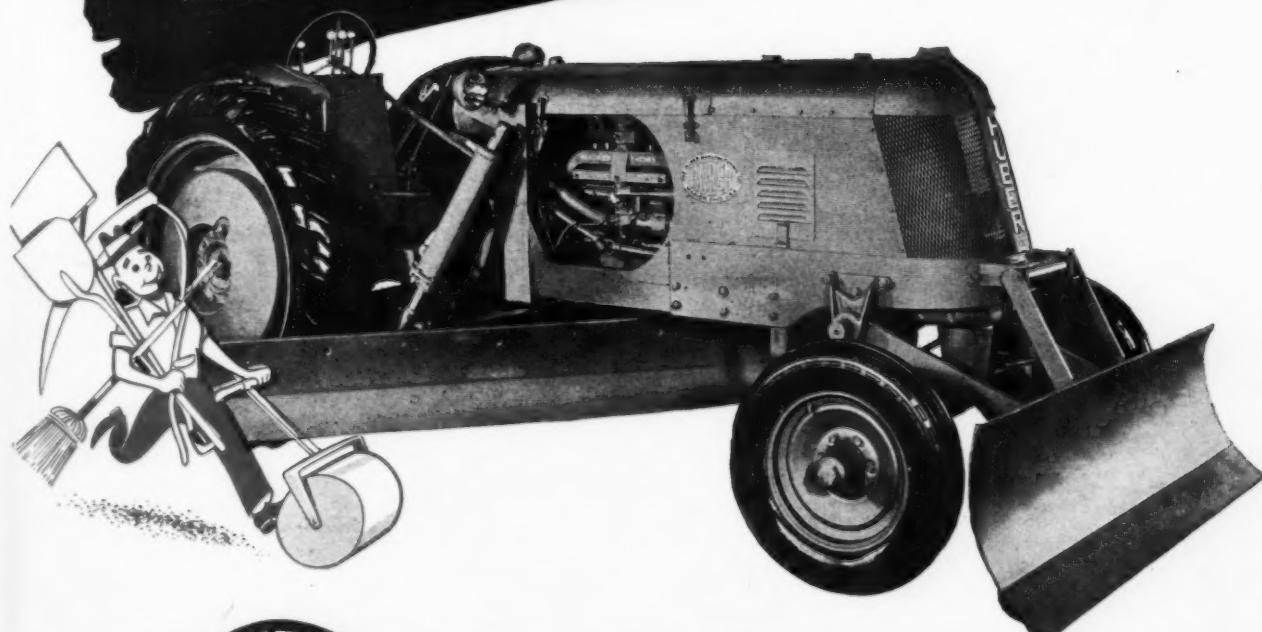
CONVERTIBLE SHOVELS—BULLDOZERS—ROAD WIDENERS
TRENCHERS—MATERIAL SPREADERS—R-B FINEGRADERS

8 MACHINES IN ONE!

THAT'S THE HUBER MAINTAINER

a machine that offers more downtime money and timesaving advantages than it was thought possible to build into one piece of equipment in the past. Check the modern HUBER MAINTAINER for: versatility in operation; economy; dependable performance; long-life service. Only one man is required to operate it in all of its duties. Then, put this ONE-MAN MAINTENANCE CREW to work the moment you can get your hands on one. Keep in touch with your local dealer.

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- 2 Mower
- 3 Bulldozer
- 4 Lift-Loader
- 5 Patch Roller
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The crawlers are long and wide to afford sure footing on soft or uneven ground. They steer from the cab with cab in any position.

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All drums and important shafts rotate on anti-friction bearings—the modern means of reducing costly friction.

★ DOES NOT APPLY TO THE $\frac{3}{4}$ YD. PAYMASTER



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LIMA, OHIO, U. S. A.

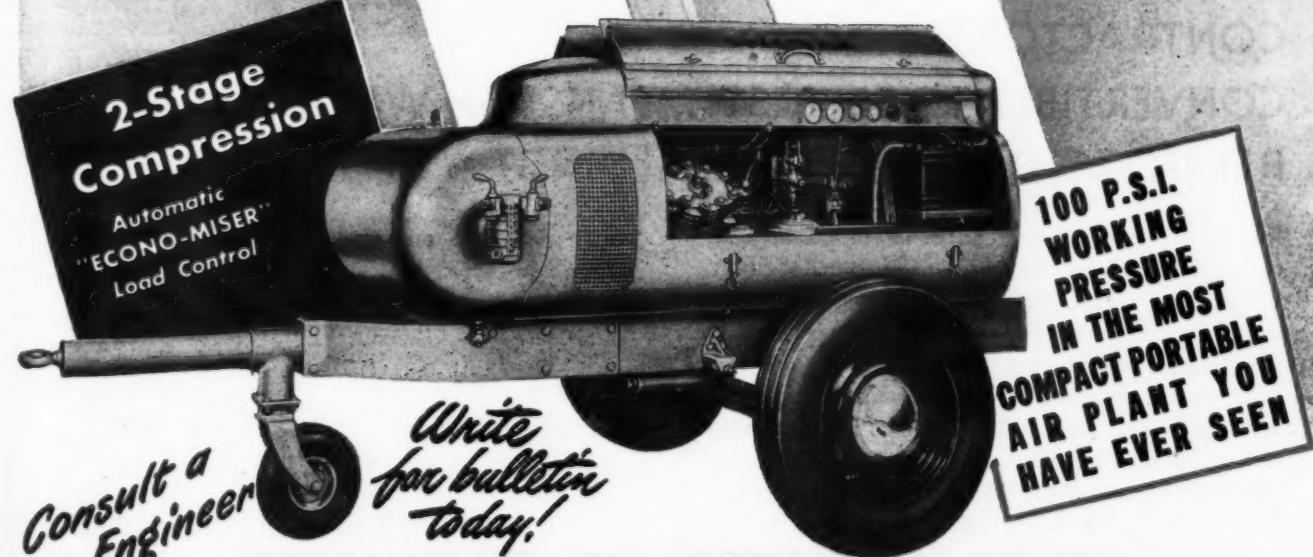
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A SLOW, POWERFUL
PISTON-PUNCH
GIVES YOU LOW-COST AIR POWER!

Get the New

SULLIVAN Series 80 PORTABLE AIR COMPRESSORS

2-Stage
Compression
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Consult a
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SULLIVAN

PORTABLE AIR COMPRESSORS FROM 60 TO 630 CFM

SULLIVAN DIVISION
JOY MANUFACTURING COMPANY

DEMOLITION OR CONSTRUCTION

-- it's all the same to a



LINK-BELT SPEEDER



CONTRACTOR FINDS CONVERTIBLE LS-85 BEST MEANS OF WRECKING REINFORCED CONCRETE BUILDING

Razing the large, reinforced concrete power house for the Cherry-Burrell Corporation at Little Falls, N. Y., and doing it fast, called for more than ordinary wrecking equipment. The contractor, Pelnik Wrecking Company, Yorkville, says, "There was only one thing to do—and we did it." They purchased a Link-Belt Speeder LS-85 shovel-crane, which was first fitted with a 70 foot boom and a 2500 pound steel ball. With this rig the huge concrete roof and walls were soon battered down. Reinforcing steel was cut with torches and then the crane, fitted as a shovel, made

short work of cleaning away the rubble, completing the job in record time.

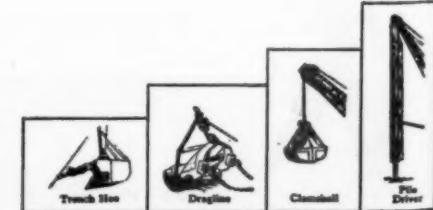
This job demonstrates the superiority of the Link-Belt Speeder method over back-breaking manual methods, and is a striking example of the versatility of the many-purpose, convertible Link-Belt Speeder.

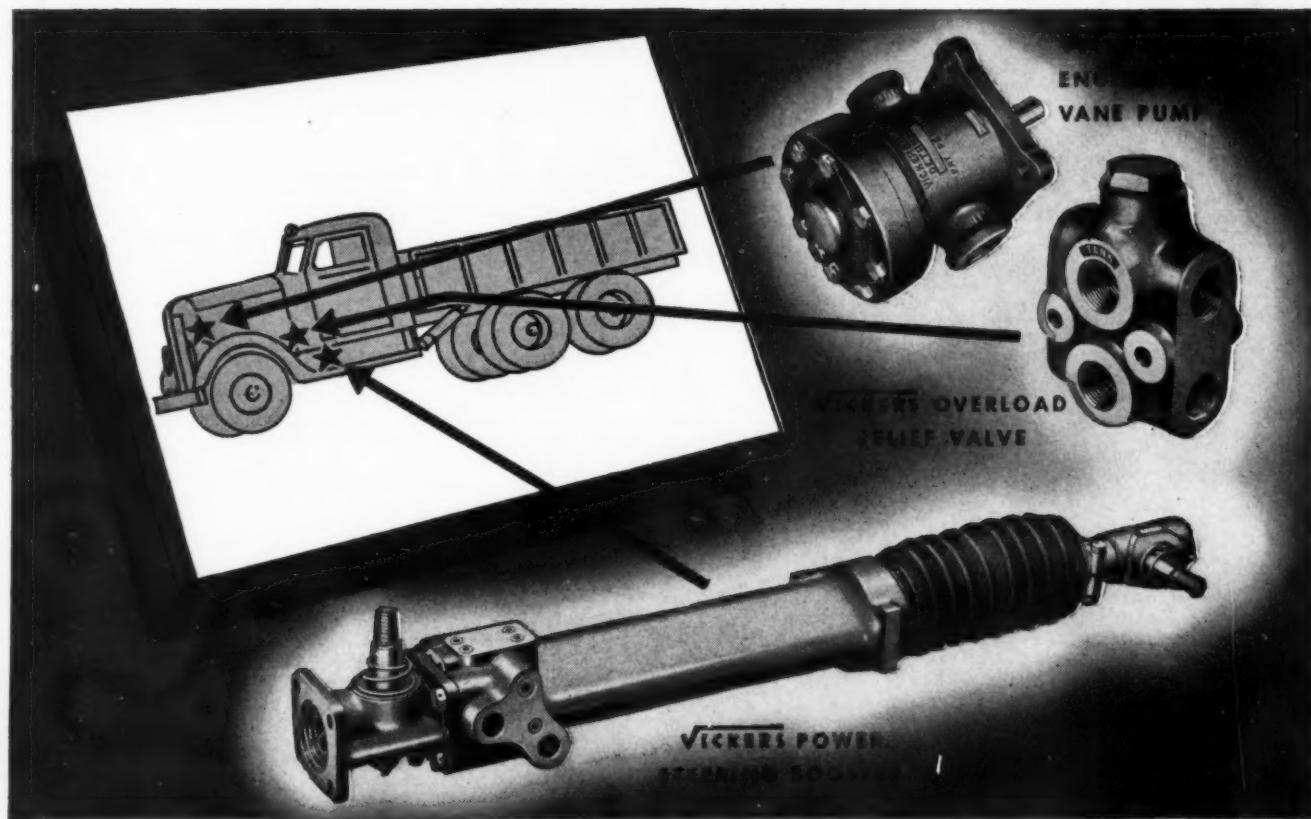
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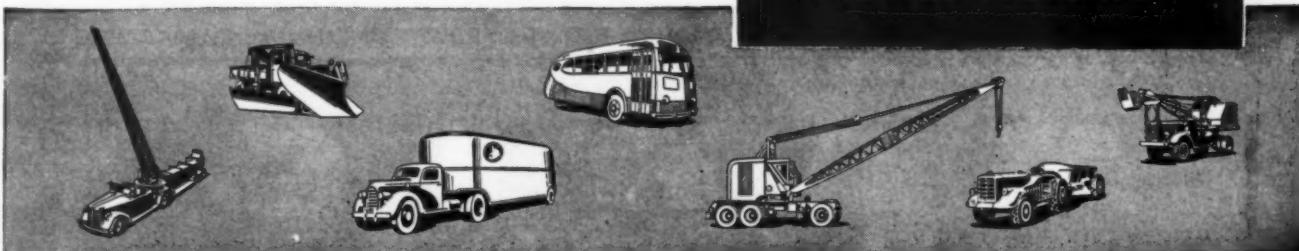
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For minimum evaporation loss and better cured concrete—for savings in labor, time and material—use TRUSCON TRU-CURE. Curing is simply and easily applied by spray *immediately* after finishing—no waiting. Provides 97% water retention in the critical first 24 hours. That means a job free from crazing and hair checks—insures hardness, strength, durability.

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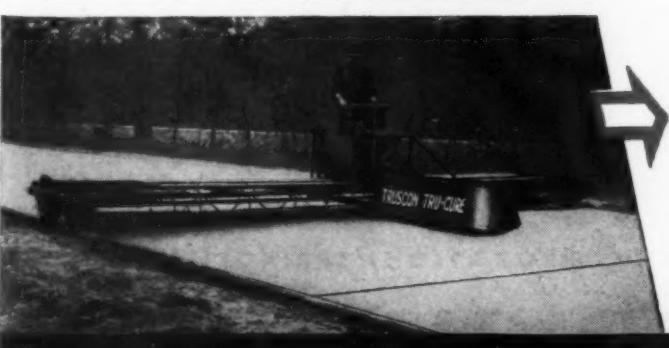
At the left you see a typical recent TRUSCON TRU-CURE job in progress. The workman with the "wand" type sprayer is right on the heels of the finishers. TRU-CURE may be had with a fugitive dye, permitting the operator to prevent thin spots—insuring an even protective, water-seal coating. No bags, no paper, burlap or cotton mats needed.

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In the progress picture at left you see the concrete mixer pouring just ahead of the curing application. This is the time, labor and material saving process—reasons that have brought approval from U. S. War Department Engineers and State Highway Engineers. Nothing bulky to handle, no waiting, no uneven curing. There is no coal tar, pitch or asphalt in TRUSCON TRU-CURE.

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Contractors on big road jobs have welcomed the special Truscon Spray Machine, a 9-nozzle applicator that does the job swiftly, economically, scientifically. Sprayer, as in photo at left, operates from a bridge spanning the work. For description of this machine and complete data on TRU-CURE write Dept. C.



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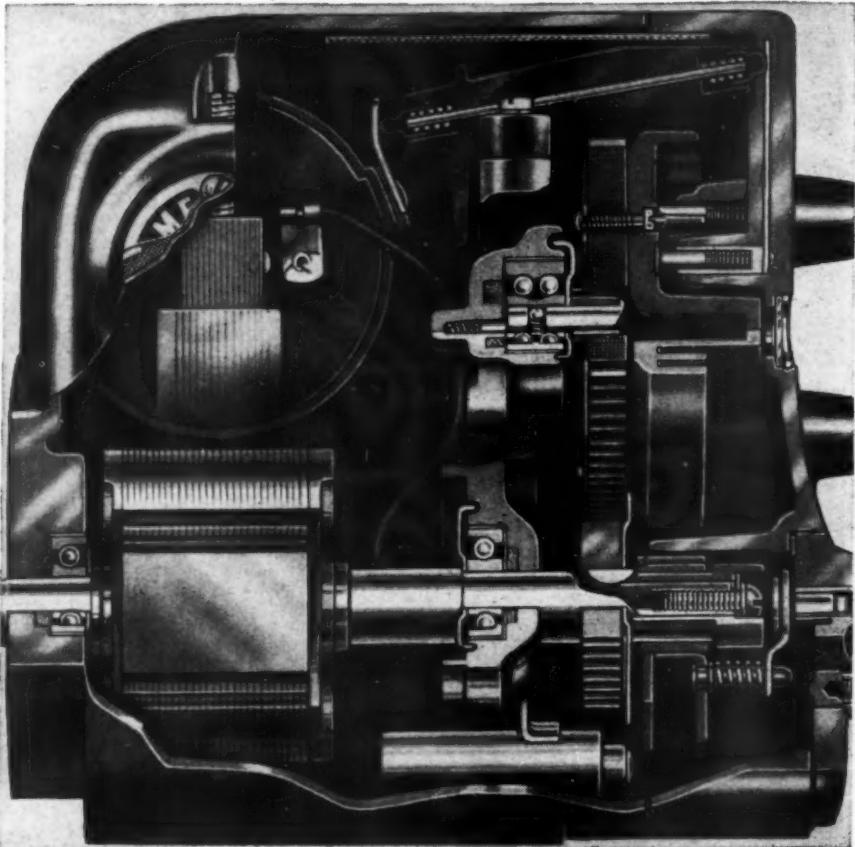
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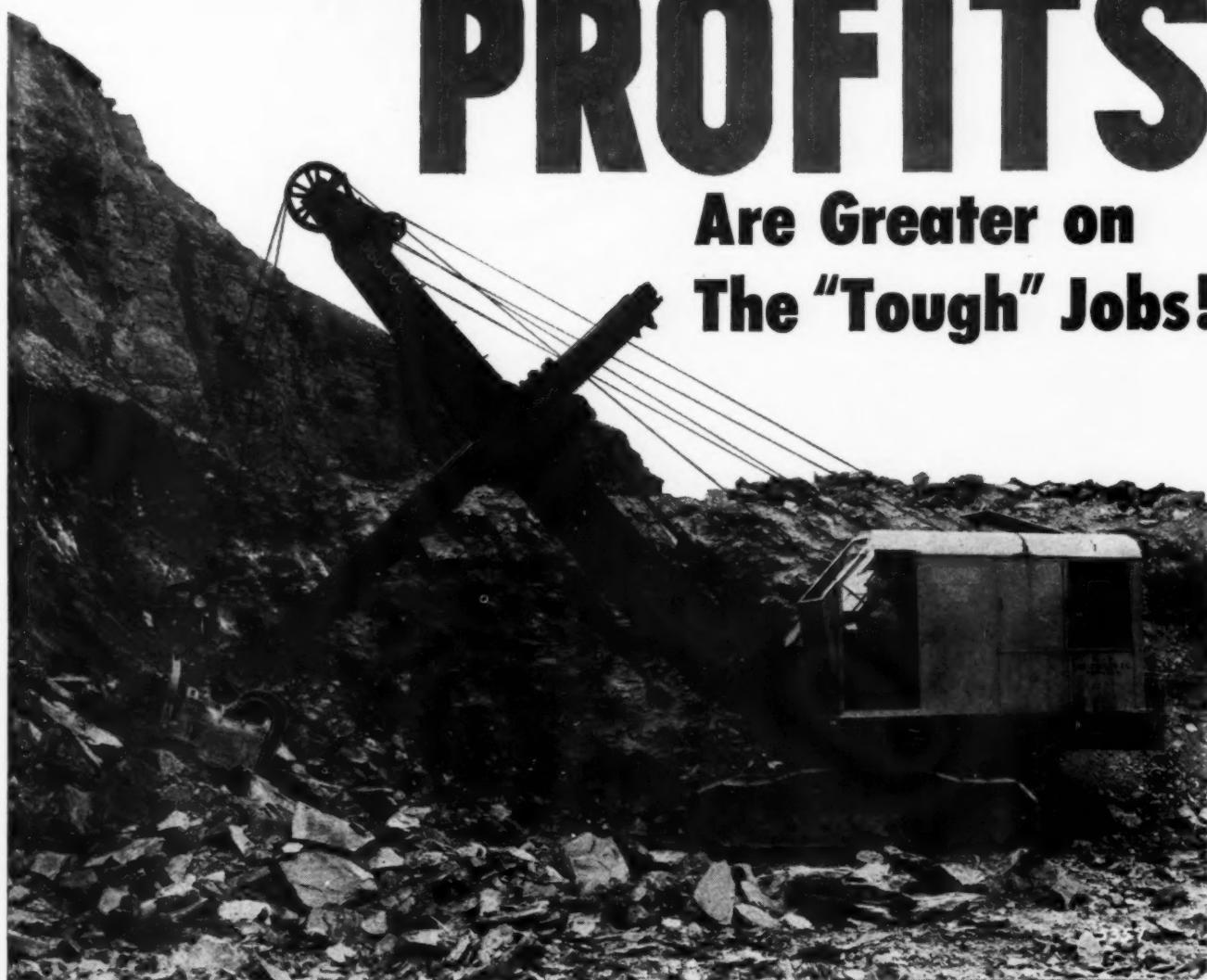
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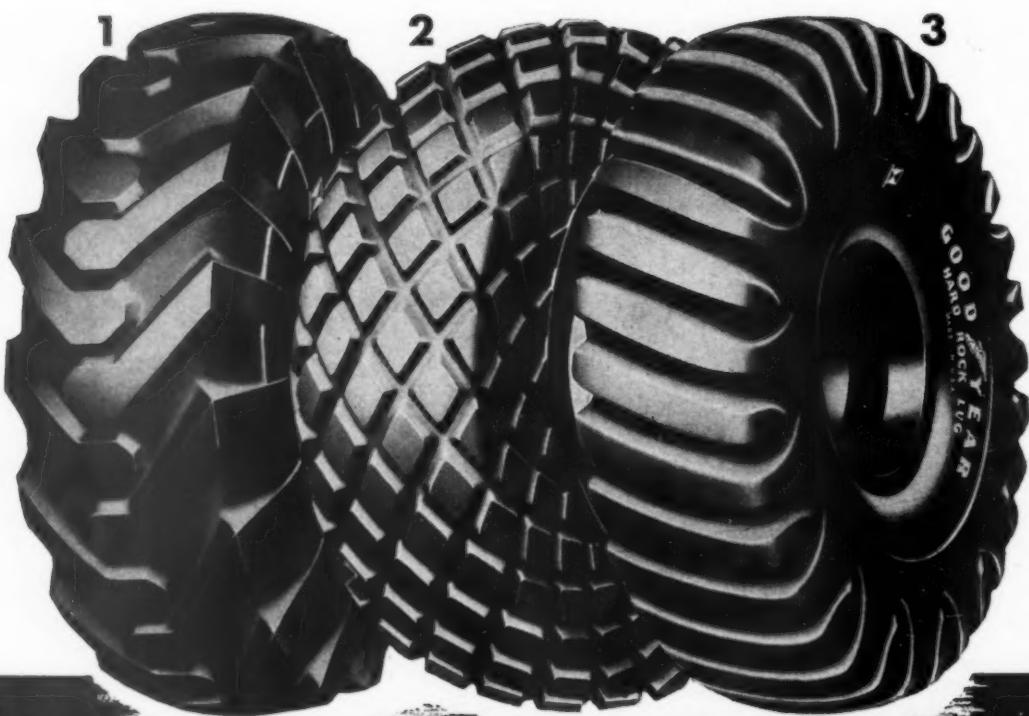
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1
SURE-GRIP EARTH MOVER
—super-traction for drive wheels on all soils (left)

2
ALL-WEATHER EARTH MOVER
—sure-roll for drawn vehicles and for general traction (center)

3
HARD ROCK LUG
—super-armored for all rough and rugged rock work

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MORE YARDS ARE MOVED ON GOODYEAR OFF-THE-ROAD TIRES THAN ON ANY OTHER KIND

New York Rebuilds

Outmoded Highway

Contractor employs modern paving equipment to expedite one of New York's first highway modernization jobs let this season

H. K. Glidden

Eastern Editor, Roads and Streets

AMONG the highway projects in New York State which are showing outstanding progress is the Depew Paving Company's job near Buffalo. This company, with offices in Depew, N. Y., bid in two adjacent contracts totaling nearly 11 miles. The cost of grading, drainage structures and concrete pavement required to modernize the highway between Lockport and Medina will be about \$800,000. This project is typical of those being advanced in the first stages of the \$840,000,000 Five Year Program of the New York State Department of Public Works for re-

building outmoded sections of its highway system. With ample funds available from the state's wartime savings, the program will be carried out just as fast as men and materials become available.

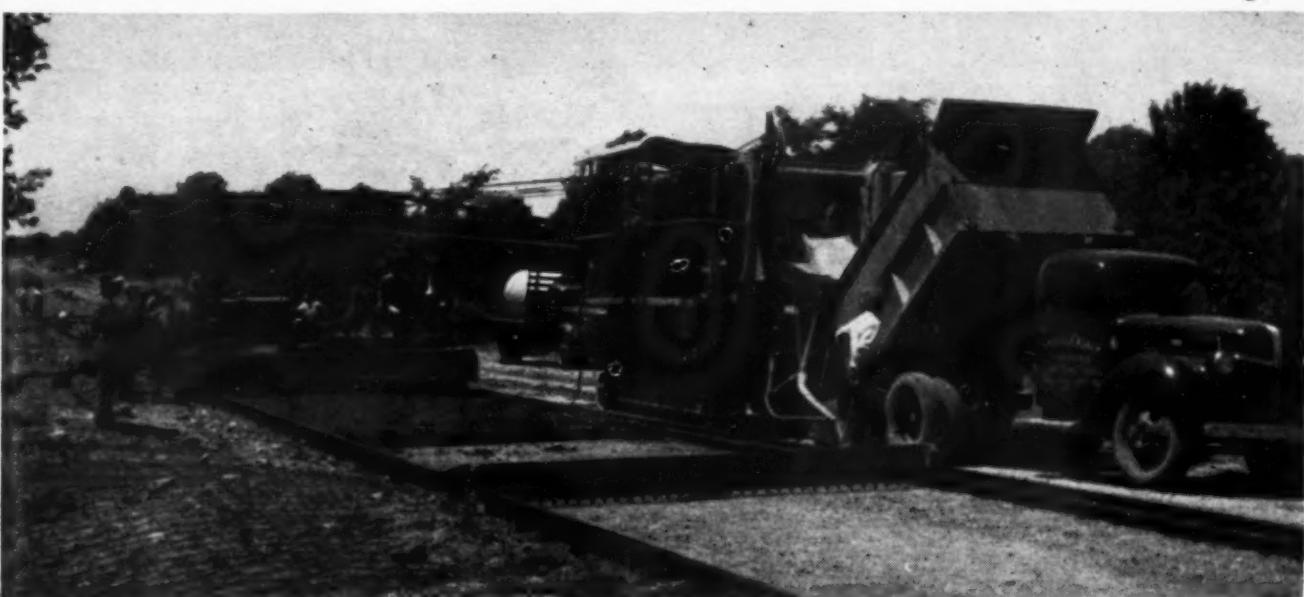
Hazards Eliminated

The engineering features of the project are of special interest because they portray a bold attack in the matter of realignment without regard for presently developed areas, while at the same time, salvaging as much of the original alignment as practical. Gasport, with a population of 900, is completely bypassed in order to eliminate two grade crossings and to dispense with the bottlenecking effect

of the narrow streets and sharp corners.

Existing pavements, both concrete and macadam, are being widened and shaped to serve as a foundation course for the concrete pavement. Present grades and alignment are being modified sufficiently to provide minimum sight distance of 1000 ft. throughout.

Savings in cost are being effected wherever possible by widening and strengthening existing drainage structures. As is shown in an accompanying photograph, old bridge abutments have been salvaged by widening the footings and by lengthening the abutments and wingwalls.



★ Recent revisions to New York specs. allow the use of 34-E dual drum pavers. Note reinforcing mesh along shoulder, spreader and finishers following mixer, and the ever-present scratch board



★ Subgrade machine does a nice job of removing excess material and shaping subgrade. Note scratch-board subgrade templet behind subgrade machine



★ Dowels at keyed longitudinal joints consist of a unique arrangement of two bolts and a cylindrical shaped nut. The bolt and nut shown are held in place by a short temporary bolt through the form which also holds the keyway form in place. The temporary bolt is removed when the forms are stripped leaving the end of the nut exposed, flush with the edge of the slab. Since the bolt which forms the dowel into the second slab is not screwed into the nut until just prior to pouring the adjacent slab, the dowel does not interfere with fine grading and runs no risk of being bent or deformed

★ Since neither plywood, ship-lap nor tongue and groove lumber were available, the contractor had to use unseasoned square-edged boards for forming. Asphalt planking, $\frac{1}{4}$ in. thick, was used to cover cracks in bridge-deck forms

★ Old bridge abutments were salvaged by reinforcing footings. Bearing and wing walls were lengthened as found necessary



Pavement Design

The normal pavement section where new alignment is used is a 24 ft. wide, 8-7-7-8 reinforced concrete slab, crowned 3/16 in. per ft. and laid on a 6 in. foundation course. The cement concrete pavement is in accordance with standard N. Y. State Highway specifications which require the use of one bag of natural cement per cu. yd.

Metal mesh reinforcement is placed near the surface of the slab. There are no transverse dummy contraction joints.

Transverse expansion joints are spaced 96 ft. 4 in. apart on this project. This distance can vary within limits and is usually determined by the length of the sheets of mesh reinforcement, used so as to result in no waste. The contractor is using a performed joint material to which are bolted load-transfer devices.

A longitudinal tongue and groove construction joint, using bolt-type dowels, separates the two slabs. The contractor plans to pour one slab for the full length of the project and then return to the starting point and pour the other slab.

The foundation course may be either run-of-bank gravel or crusher-run stone. The contractor has found it expedient to use gravel, part of which is coming from an abandoned railroad right-of-way. The foundation course extends 12 in. on either side of the pavement.

Salvaged portions of the old alignment include sections of both bituminous and concrete pavements 16 ft. wide. These pavements are being widened with a 6 in. thickness of foundation course material and used as the base for the concrete pavement. The surface of the existing pavements are being shaped wherever found necessary with a leveling course of foundation material. One-half in. round deformed shear bars 24 in. long, and spaced on 24 in. centers, are being placed in the slab normal to the centerline and over the joint between the old pavement and the widening of foundation course material.

Contractor Well Equipped

The Depew Paving Co. has managed to assemble a smooth-working, modern grading and paving outfit, despite the usual difficulties encountered in purchasing equipment. They have done this by scouring the country and bringing in some units from as far away as North Carolina. Where necessary, old-time equipment has been rebuilt and made to function almost the same as new. The company has found it necessary in



★ Bulk cement is delivered to the batching plant in trucks fitted with tight canvas covers

★ Francis Gunlach, office engineer, on the left, and Charles C. Gibbs, superintendent in charge of the project, size up a widening problem

the case of a 27E paver, used on bridge work, to purchase an identical unit to be sure of having repair parts.

The contractor has taken full advantage of a permanent quarry and



N.Y. Revises Paver Specifications

34E Dual-drum Now Permitted

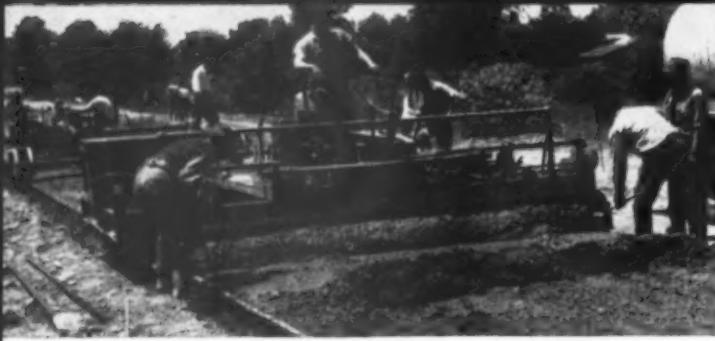
NEW YORK State's new specifications are just now going to the printer. For your information we are quoting clauses that will govern types of pavers that may be used on work advanced after they are available and in effect some time this summer.

"Reference is made to the pamphlet of Concrete Mixer Standards, (17th revision), as approved Mar. 5, 1945, by the Associated General Contractors of America, Inc. The size and type of construction mixers there shown are approved for use. The District Engineer shall approve the size used for any particular project. Size of paving mixers shall not be smaller than the 27E and shall not be larger than the 34E single or two-compartment machines.

"For a single compartment mixer,

mixing shall be continued for at least one and one-half minutes, after all the materials are in the mixer drum. The drum shall revolve at a rate of not less than 14 nor more than 20 revolutions per minute. No charging of the drum will be permitted until the drum has fully discharged the previous batch.

"For a dual compartment mixer, the interval of mixing time (including transfer time) for each batch, shall be not less than two minutes after all the materials are in the mixer drum. The drum shall revolve at the rate of not less than 14 nor more than 20 revolutions per minute. The compartments shall be so interlocked that no charging of a compartment can occur until that compartment has fully discharged the previous batch."



★ Combined screed and finishing machine follows concrete spreader

crushing plant which the Quarry Division of Wickwire Spencer Steel Corp. has located about midway of the project. A railroad siding and ample space make the site ideal for the batch plant location.

Joe Cerullo, President of Depew Paving Co., lives on the job and is to be found wherever the going is toughest. Joe is a great believer in scratch-



★ A longitudinal finishing machine completes mechanical finishing. Broom finish is secured by dragging an ordinary heavy-duty broom across the slab

board templates. He says that they keep the inspectors from taking up a lot of his foremen's time. There are three templates on the job, and if the pavement isn't full thickness, it will not be Joe's fault.

Barring unusual weather conditions, strikes, and material shortages, there appears to be no doubt that the contractor will meet the Dec. 1,

1946, completion date called for in the contract.

Vermont Has 168 Covered Bridges

There are 168 all covered wooden bridges in the state of Vermont. Of these 7 are railroad bridges, 157 are on public highways and 4 are privately owned. (Six spanning the Connecticut River between Vermont and New Hampshire have been counted as one-half each.)

The high county is given as LaMoille, with 19 highway and 4 railroad bridges. This is followed by Washington County with 19 highway, 1 railroad and 2 private bridges; and by Windham county with 20 highway bridges.

The Town of Montgomery in Franklin County has 8 covered bridges, which is more than any other town. Lyndon, Cambridge, Rockingham and Weatherfield are next with 6 each. Thetford, Tumbridge and Northfield have 5 each.

The State Highway department of Vermont, Montpelier, Vt., has made available for free public distribution a map showing the location of all covered wooden bridges in the state.



★ Bulldozer pushes existing shoulder material into place for new shoulder as first step in pavement widening

★ Transverse expansion joints are located 96'4" apart on this project. Note the load transfer devices attached to the pre-formed expansion material. Scratch-board sub-grade templet is in place at the right of the joint

★ Reinforcement mesh to control cracking is placed near top of slab. Spreading machine covers reinforcement as soon as a short stretch of mesh is in place



Curbs Sandblasted

before repainting yellow no-parking zones

THE parking scheme in downtown Colorado Springs, Colorado, was changed early this summer to get ready for an unprecedented rush of vacation visitors. This meant removing yellow "no parking" paint in some instances and a general curb repainting program. The problem of what to do with old, faded paint areas that still showed a faint yellow was involved—a condition that was somewhat of an eyesore as well as a possible source of confusion.

The solution worked out by the street department was to close off a block at a time on one side of the street and sandblast the curbs clean. A commercial sandblasting outfit was mounted on a trailer for the purpose, as shown in the accompanying scenes.

The procedure was to set up a row of stands along the outer edge of the parking lane and rope off that lane early enough in the morning so that parked, locked cars wouldn't hamper the job. Then the outfit came along and speedily blasted the curbs through the block. The crew covered one or two blocks a day.

A street sweeper then picked up the sand accumulation, and a paint crew followed almost immediately and put on new markings, including a freshening up of parking lane stripes.

The blasting operation naturally afforded an opportunity to do minor surface repairs to the street asphalt. Small surface cracks and wavy spots were ironed out with an acetylene torch which surface-heated just

enough material to permit sealing with a few passes of the iron.

Frank Ray is city engineer and Milton J. Strong, superintendent of streets of Colorado Springs.

Highways Exempt From Steelman Order

According to an official statement by the Public Roads Administration the federal-aid highway program will not be appreciably affected by the Steelman order declaring a moratorium on federal construction. The PRA has advised the state highway departments that the order contains no direct reference to highways and will not affect projects where commitments have been made. Any project which has been programmed with the PRA, regardless of its status, is considered as a commitment and will be permitted to go ahead. Just what the exact status will be of projects not programmed was not made clear but it is understood that considerably more work is already programmed than will be possible to get under way this year.

At the same time the PRA has reiterated its policy of disapproving projects exceeding fifty per cent of 1940 prices and has informed the state highway departments that this criteria will be more closely adhered to in the future. Also PRA has advised the state highway departments that projects involving structural steel should be wholly eliminated.

Calling attention to the fact that the Steelman order in no way affects the preparation of surveys and plans the PRA urged the highway departments to make every effort to expedite advance planning.



★ Before the curb blasting outfit came along, a street repair crew took advantage of the roping off of traffic to make minor pavement patches. These men are using a small acetylene surface heater outfit and hand tool to fuse and smooth small cracks in the asphalt. Small amounts of sand are worked into the materials as it melts, care being taken not to overheat.

★ Trailer mounted outfit for sand-blasting curbs. Portable compressor sets across the trailer bed, and a pressure blasting unit is mounted on the back end. A street sweeper follows and removes accumulated sand





★ Macco Construction Company's jetting operation. Note the gush of mud and water. The air blow pipe had not been put to work when this scene was snapped, but is seen held suspended alongside the casing

How approximately 300,000 linear feet of sand-filled holes are being sunk under fill areas and around structure sites on the new Terminal Island Freeway at Los Angeles. Designed to safeguard adjacent oil well casings, pipe lines and transmission towers, drain hole locations are determined by state highway laboratory personnel. Ingenuity shown by contractors in devising field methods and equipment.

Vertical Sand Drains for Accelerating and Controlling Ground Settlement

By **Harold J. McKeever**
Editor, ROADS AND STREETS

THE construction of roadway embankments across marshy or unstable ground is usually no serious problem to highway engineers. If the unstable area is not too large or deep, the material may be mucked out and replaced. For more extensive areas the common practice is to toe out the fills to extra width or add counterweight fills, in order to minimize lateral displacement and adjacent swells. A period of months or years is then allowed for the roadway to reach complete stability, during which time a temporary pavement may be necessary.

None of these solutions was considered feasible in building the new

Terminal Island Freeway, now under construction in the Los Angeles Harbor vicinity. This new multi-lane divided expressway, which will cross unstable, high-water-table ground on a raised grade, will immediately be called upon to carry scores of thousands of vehicles daily, including a high percentage of very heavy trucks. The road will be the main artery between central Los Angeles and the highly industrialized harbor area, which includes the U. S. Navy's San Pedro and Terminal Island facilities and one of the thickest forests of oil wells and refineries in the world. A heavy-duty permanent pavement naturally has to be provided from the start, and for this reason alone it was considered desirable to get final settlement of sub-soil in a period of weeks.

An even more serious consideration, however, is the close proximity of an unprecedented number of oil wells, oil and gas pipe lines, high-line transmission towers and other utilities. Utility engineers were concerned over the possibility of lateral ground displacement or swell, which might disrupt underground installations, displace tower footings and cause other damages running into huge sums.

Sand Drains Adopted

It was only natural, hence, for attention to be turned to the use of vertical sand drains. This device, as developed and used by the California Division of Highways and U. S. Engineers, was employed successfully during the war in the peat bogs around Fort Bragg, near San Francisco, to cite one instance. The prin-

principle of vertical sand drains is simple. You just bore a pattern of holes in the ground before placing the fill, so that ground water will be squeezed out rapidly and subsidence accelerated, thus minimizing excessive hydrostatic pressure and lateral displacement.

At Terminal Island, as in previous cases, specifications called for sinking holes to relatively stable strata, backfilling the holes with a gravelly sand and blanketing the whole area with a layer of porous material before placing fill.

Aided by the use of temporary surcharges it is expected that such a system when constructed at a controlled rate, will help achieve at least 90% of the final subsidence in about three weeks after the temporary surcharge is placed and will virtually eliminate lateral displacement and formation of adjacent bulges, blisters, or blow-ups. As the underlying soil solidifies in place its behavior will be observed by measurements of displacement points, settlement points and pore pressures in well points.

Vertical sand drains have been specified and included in the bid items on three Terminal Island Freeway contracts to date. Following a procedure set up from experience, sufficient power and hand borings are taken to develop an accurate soil profile down to stable layers.

The soil underlying these projects consists of strata of sand, silty sand, clayey sand and silty clay as shown in the accompanying cross-section. From the soils data, general instructions are printed on plan sheets and included in special specification provisions. Permissible range in depth is given, and the spacing in terms of square feet of ground area per hole at various stations along the job, from which data the contractor can prepare a fair estimate. Actual depths are determined as each hole is driven, and a gridiron of hole locations is staked out by the engineer from a field plat.

Drain holes, on these projects, are specified to have a diameter of 18 to 22 in. Depth of holes has varied from 35 up to 50 ft. The porous blanket is two ft. thick and extends just beyond the toe. Holes are spaced in the ratio of one to every 100 sq. ft. up to one every 400 sq. ft., depending on the height of the fill, proximity

of utility or bridge structures and nature of the soil.

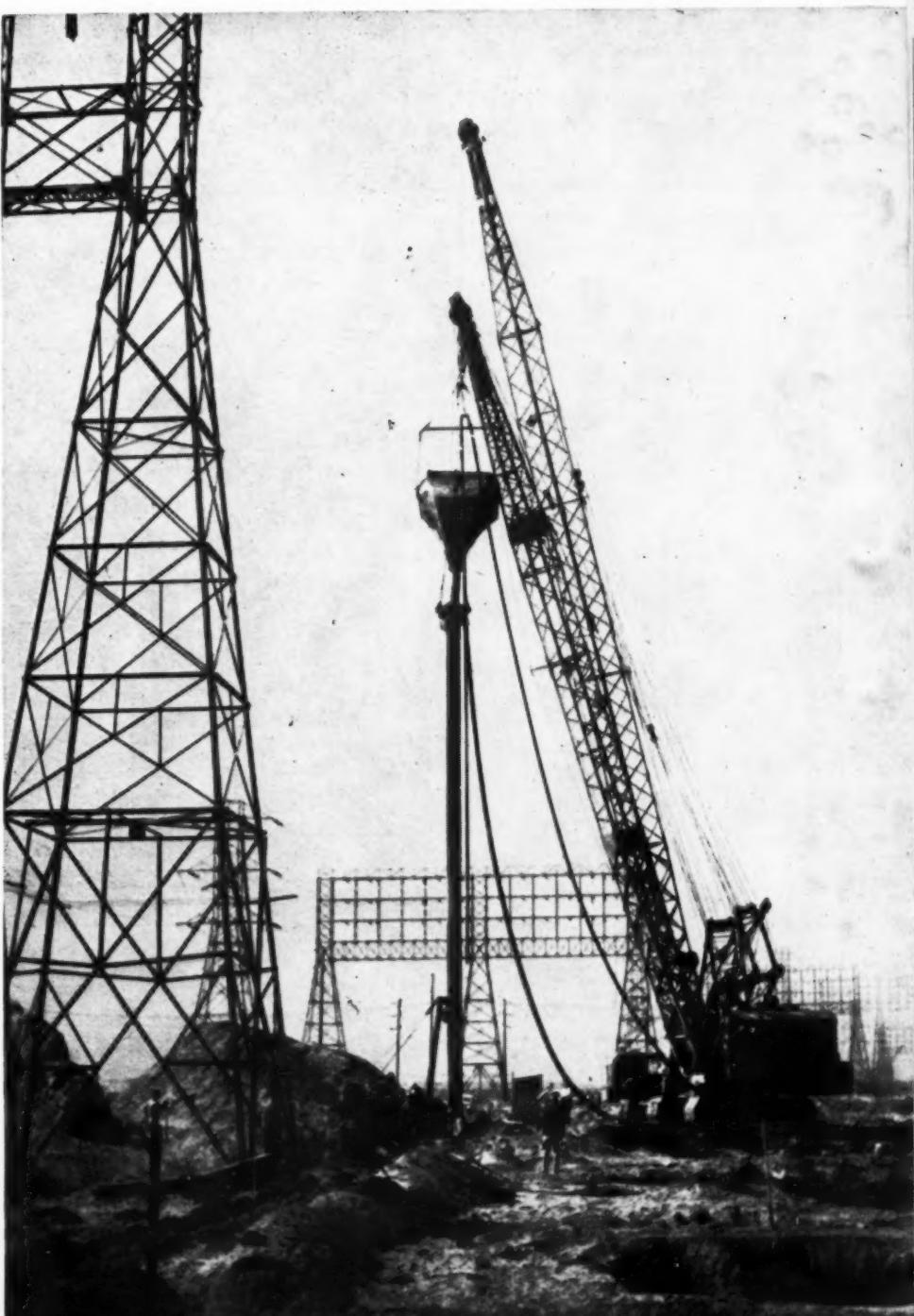
In order to further accelerate any settlement that will take place, an 8-ft. surcharge layer of fill will be placed and subsequently removed. Subsidence checking platforms, installed on top of the ground before filling begins, are fitted with manometers whose elevations can be determined by means of $\frac{1}{4}$ -in. tubing extending to the toe of the fill.

Bids Varied Greatly

Relatively little data are available on the cost of installing drains of this type, and it is not surprising in view of the unsettled times that bids varied greatly on this work. Bids depended somewhat on the method the contractor had in mind, since the

specifications give considerable leeway. Macco Construction Co., of Los Angeles, who were awarded the 2.1-mile section of the Terminal Island Freeway between Henry Ford Avenue and Willow Street (\$1,141,000, see accompanying tabulation), bid 144,000 lin. ft. of sand holes at \$0.80, and 16,500 tons of sand backfill at \$2.00 (quantities estimated). The eight unsuccessful bidders quoted variously from \$0.64 to \$1.50 for the holes and from \$1.50 to \$3.50 for the sand filling, these figures possibly representing considerable guesswork in bid lists that were unbalanced to begin with.

J. I. Barnes Construction Co., of Santa Monica, which has a \$1,672,000 roadway and structure contract for the Freeway overpass and inter-



★ The sand filling job is now done, and the casing being withdrawn. This calls for nice teamwork between the operators. The 85-ft. crane nearest handles the casing (and air pipe) while the 110-ft. crane holds the hopper suspended in feeding position. Note proximity of transmission tower

change at Pacific Coast Highway intersection, bid \$0.80 for 133,600 lin. ft. of holes and \$1.50 for 20,000 tons of sand backfill.

Oberg Construction Co., of Inglewood, Calif., awarded a smaller contract for a ramp structure, bid \$1.00 for 15,000 lin. ft. of holes and \$2.00 for 2,000 tons sand. In both the Barnes and the Oberg jobs, other bidders also varied greatly.

Macco Outfit Setting Fast Pace

The writer happened to visit the projects at a time when Macco Construction Company had made a good start and shaken most of the "bugs" out of its procedure. This company's job involves a probable 3,800 holes, of which about 300 had been put down to the required depth. Macco's procedure is to jet a casing down with a combination of water and air, flush with water until suspended silt and clay are within the 2% specifications as judged by usual inspections and quick field checks. Then immediately sand is fed into the top of the casing, the sand settling into the water-filled

hole by gravity. As the casing is withdrawn, continuous backfill is indicated by depletion of the cone in the hopper atop the casing and by expulsion at the ground of water displaced by sand.

This method is simple, yet much has depended on refinements in equipment and experience of the crew. Accompanying photographs show some of the details of the casing, which is of Macco design and manufacture and which has proved very efficient after making several modifications. The casing has an outside diameter of 19 in., inside diameter of 16 in. and a length of 62 ft. It is of double walled construction, consisting of one welded steel pipe inside another. The upper end is capped and sealed with a heavy steel casting. The head casting includes three lifting fins with clevis holes; an 8-in. inlet pipe to the hollow wall to which can be threaded a pressure hose from the water tanks; and a rim for receiving sand fed from a suspended hopper.

Air is supplied independently as desired, through a 3-in. pipe about 60

ft. in length, connected by hose coupling to an air tank and inserted varying distances down into the casting through the top by a separate crane cable. The sealed nose of the pipe is perforated with numerous $\frac{1}{8}$ in. holes.

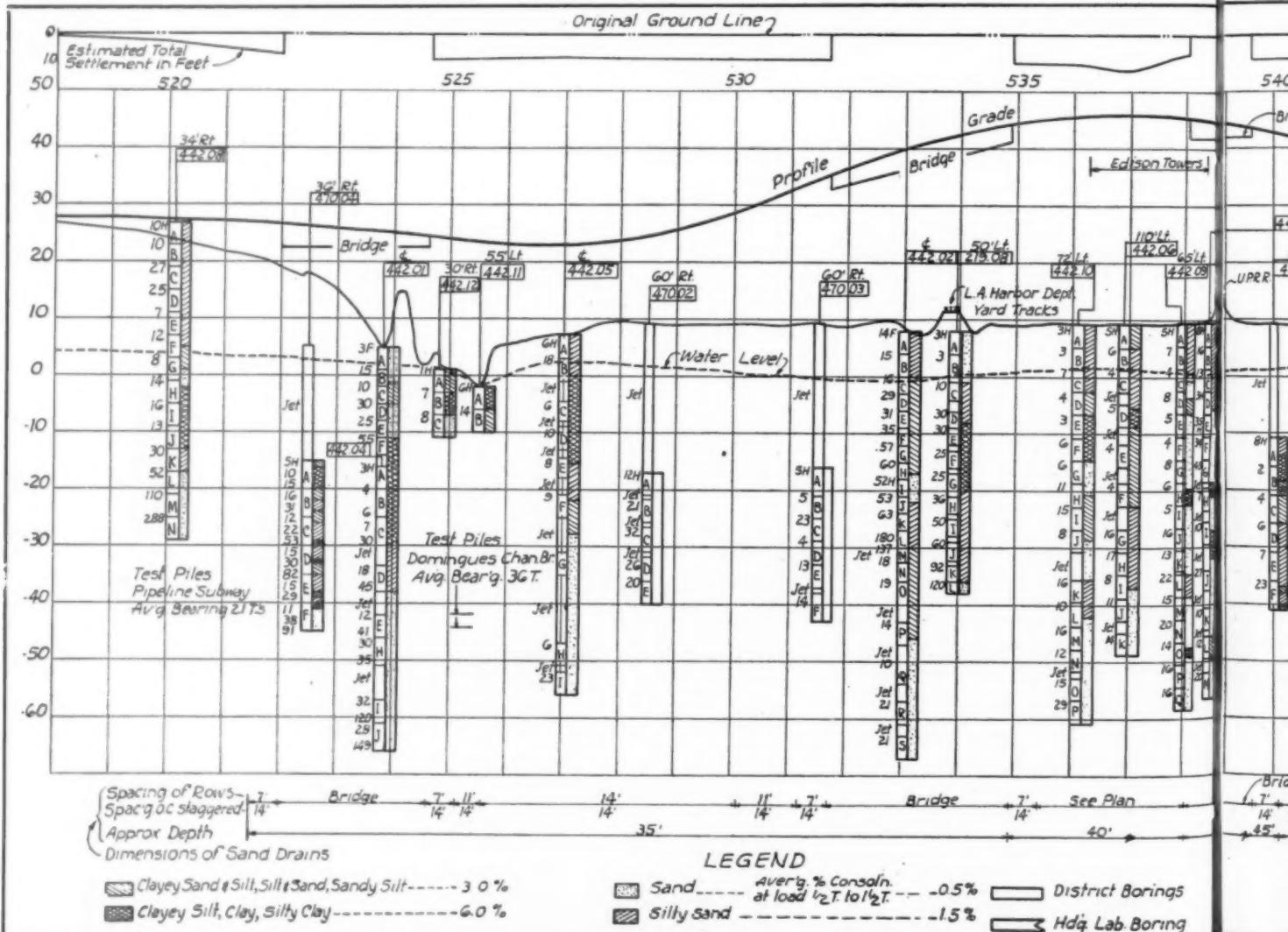
The bottom end of the casing is fitted with a cutting rim and a set of 24 jets (see photo). Sixteen of the holes jet straight down, and every third hole jets inward at an angle of 45 degrees.

Macco's Equipment

Macco's jetting work is built around three crawler cranes, which usually must have mats. One with an 85-ft. boom comes to the working area first and is used to set the casing and blow pipe off the trailer. Then comes two large compressors, one being a standby, and two water pressure tanks of 10,000 and 5,000 gal. capacity and two 6-in. centrifugal pumps (again, one a standby). The air and water equipment are centrally located to serve one or two days' driving.

Next arrives a truck crane for

★ Soil profile, boring record and hole location scheme for sand drains near arterial intersection

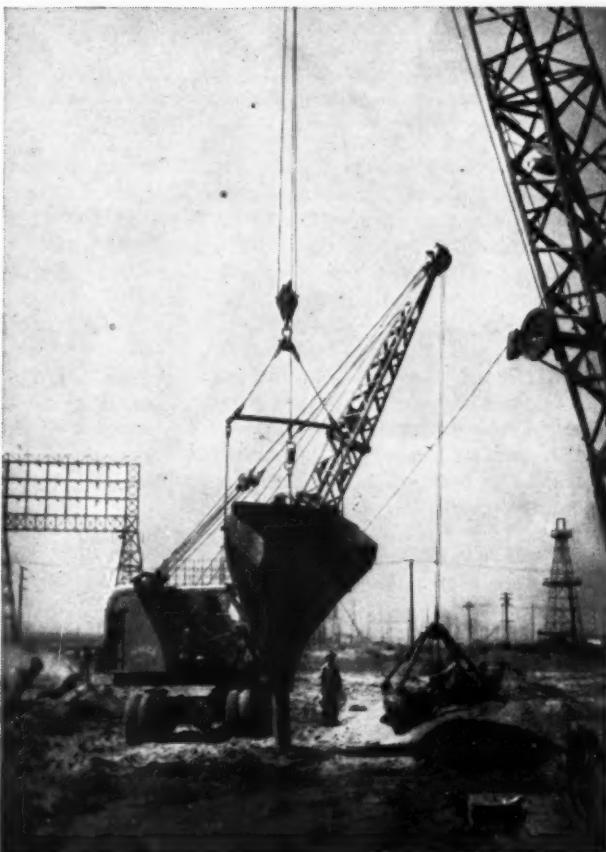
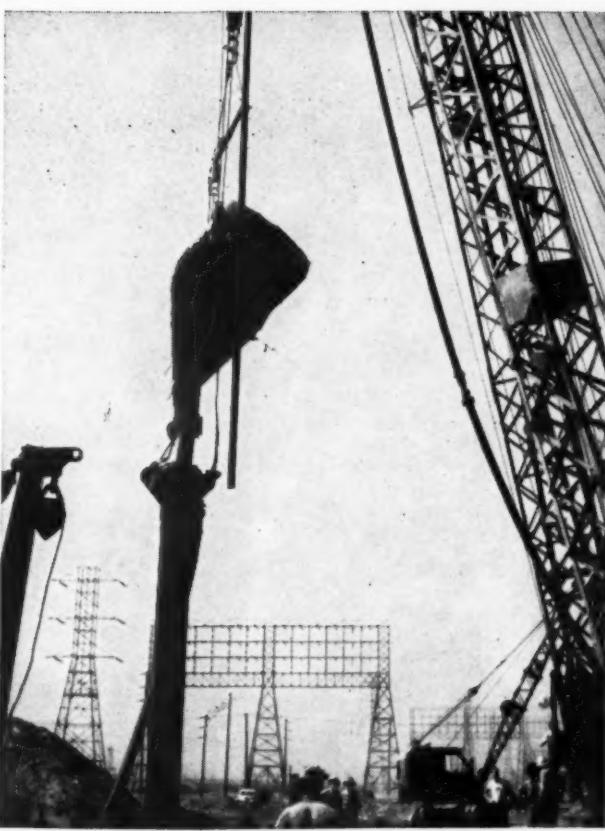
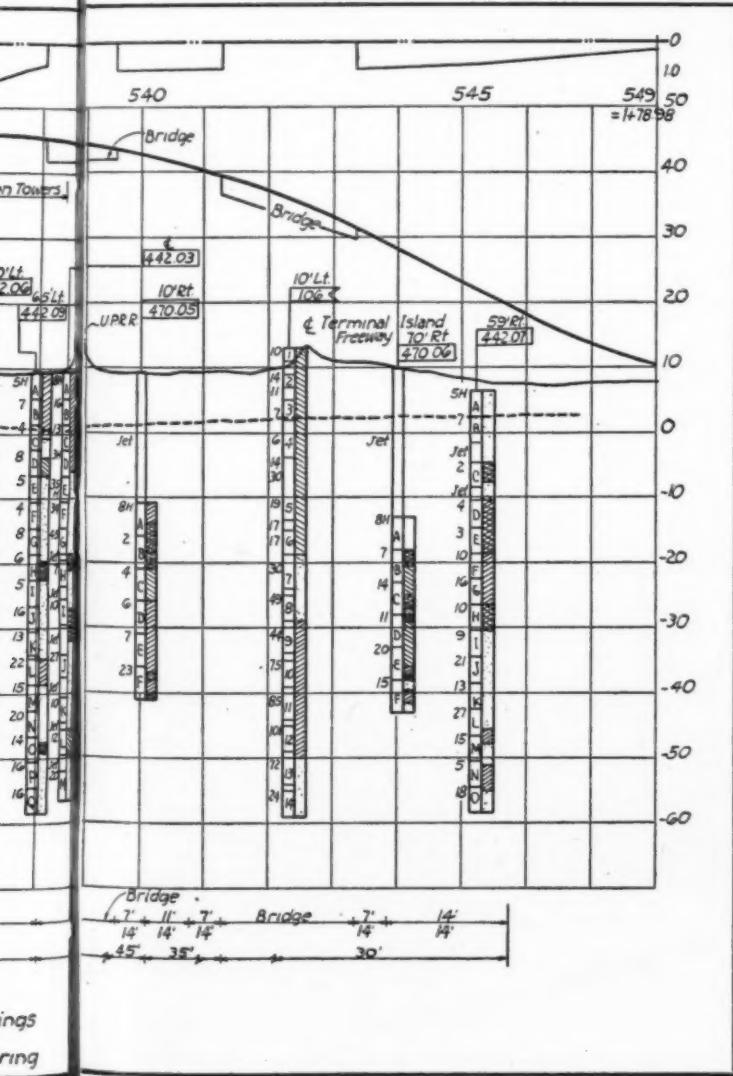


clamshelling sand; also a second crawler crane, equipped with a 110-ft. boom, which is used to lift the sand hopper and hold it in suspended position while depositing into the casing.

A typical sinking operation goes something like this. The 85-ft. crane up-ends the casing, after the water hose is coupled, and the casing is brought to rest in position for jetting. A shallow hole may or may not be dug first to insure accurate location. Jetting commences, at a pressure which may reach a maximum of 450 psi. The pipe is allowed to sink of its own weight, aided by periodic lifting and dropping. As the sinking progresses, muddy water gushes out at the top of the casing, often bringing with it large chunks of material, so strong is the pressure.

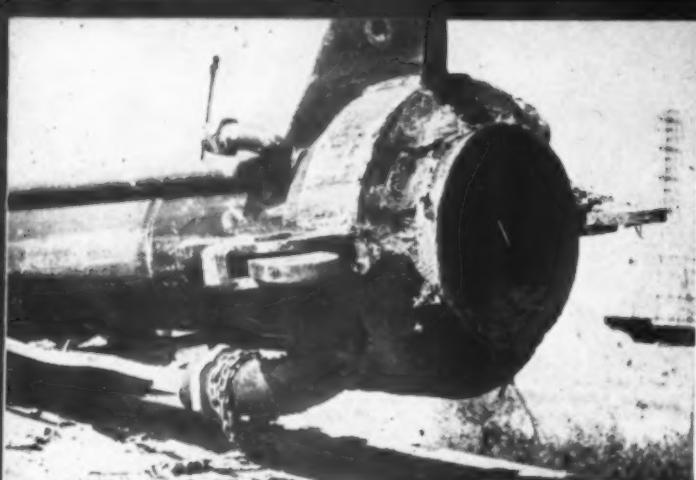
The operation is watched closely by the engineer or an inspector, who can tell by the ease of sinking and character of material emerging about when the hole has been sunk far enough. Then comes the flushing operation. This consists of a brief period of further jetting aided by inserting the air pipe suspended from a separate line on the same crane. The air pipe is then withdrawn. Finally comes the sand filling operation. The truck crane has in the meantime clamshelled a 5 or 6-ton load of sand into the hopper, which is specially designed to feed sand "eye dropper" fashion into the casing head. The hopper is held in an upright position just off the ground by the 110-ft. crane while the truck crane loads it, then is hoisted and held suspended with nose fitted into the casting until discharged.

Superintendent Earl Purcell on the Macco job has



★ (Upper) Here the hole has been jetted and flushed clean with air and water, and sand filling is in progress through a specially constructed hopper

★ (Lower) How the long-boom crane holds the hopper while a 3/8-yd. clamshell loads the sand. Note trip line leading to the dumping latch



★ Close-up of head casting, and the business end. There are 24 jet pipes, one-third of which are at an inward angle. These details represent considerable experimentation by the contractor and engineer. Seen alongside the jet end is the perforated nose of the blow pipe (chained in this parallel position during transportation)



★ A 10,000 and a 5,000 gal. water pressure tank and two 8-in. pumps insure a powerful, steady jet supply. Note also the two air compressors

gradually speeded up the jetting job until at the time of the writer's visit he was putting down a 45 to 50 ft. hole and filling it in as little as 12 to 20 minutes. Two holes per hour was the usual rate, including various minor delays, and his best day's run up to then was 19 holes in 8 hours. He explained that still further speed would be necessary to get costs down to where there was any profit in this part of the project. A second shift was contemplated. The crew, incidentally, consisted of ten men including three crane operators, a man on pumps, helpers and foreman.

The Terminal Island projects are being directed by the Los Angeles district staff of the California Division of Highways, S. V. Cortelyou, district engineer, and F. B. Cressy, district construction engineer. George Halton, district materials engineer, has worked closely on the projects in conjunction with representatives of the headquarters materials and research staff.

George Langsner is resident engineer on the Macco job here described.

★ The casing and blow pipe are transported between crane set-ups by a trailer and handled with a rope sling

The adjoining contracts involving sand drain installations—those of J. I. Barnes Construction Co. and Oberg Construction Co.—are in charge of resident engineers W. D. Eaton and J. W. Curran, respectively. Oberg had not started. The writer did not record the details of the Barnes work, which was just getting under way, but it is understood that a similar jetting procedure and equipment will be used.

Specification Details

Of interest is the wording of special provisions in the California state specifications pertaining to sand drains. Here are some of the paragraphs included on the Terminal Island work, covering details not described elsewhere in this article.

Sand Drains—Where shown on the plans or directed by the Engineer, vertical sand drains shall be constructed as herein specified and as directed by the Engineer.

Vertical holes . . . shall be excavated to underlying firm strata or to such depth as the Engineer orders, and the holes backfilled with sand. The holes may be excavated by cutting or augering out the material, by jetting a casing down to the required depth, by driving with a pile driver and plugged mandrel, or by other approved methods. Any method of excavating or constructing the holes which, in the opinion of the Engineer, is appreciably disturbing adjacent existing ground shall be discontinued. Holes that are out of place and holes that are damaged in excavating or during placing of sand backfill shall be back-filled and abandoned, if so ordered by



the Engineer, and no compensation will be allowed for furnishing materials or doing work on such holes.

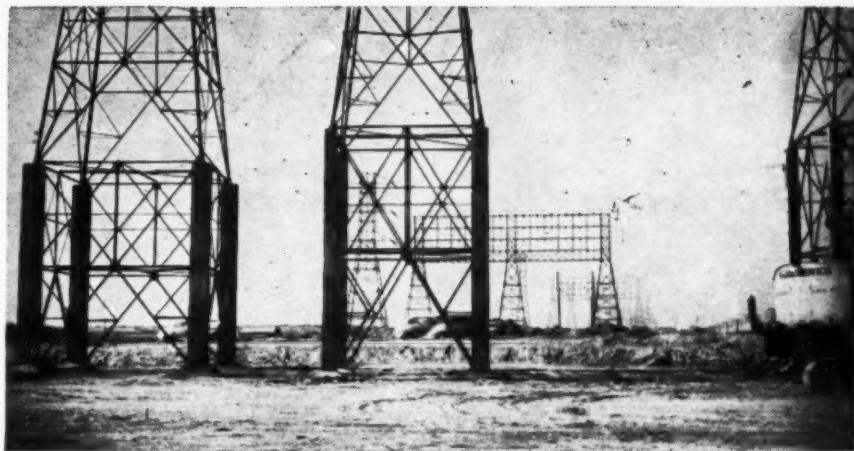
If the Contractor elects to excavate the holes by jetting a suitable casing to the required depth, the jetting shall be continued for a sufficient length of time after the casing has reached the required depth to remove all solid materials within the casing. After the hole has been backfilled with sand, the casing shall be removed.

Holes that contain muddy water shall be pumped out until the water does not contain more than 2% of silt or clay.

Each hole shall be inspected and approved by the Engineer before any sand filling material is placed therein.

Material excavated from the holes shall be disposed of as provided under "Earthwork" of these special provisions.

Material for use in backfilling the holes shall consist of clean sand conforming to the following grading requirements:



★ The freeway embankment at this point rises to cross over an arterial street, and will envelop the tower legs. Note concrete reinforcement of legs. Towers over one grade separation will have to be raised ten feet in order to maintain minimum overhead sag clearance. Utility changes alone will cost over \$40,000

Sieve Size	Percentage Passing Sieve
1/2"	90 to 100
No. 8	25 to 100
No. 30	5 to 50
No. 50	0 to 20
No. 100	0 to 3

In determining the lineal feet of

vertical holes (sand drains) to be paid for, the depth of each hole will be measured from the top of the imported borrow working table to the bottom of the hole. The quantity of sand

Bids on Section of Terminal Island Freeway, Los Angeles, Calif.

Project: Sand drain installation (as described in accompanying article), drainage structures, grading, paving with asphaltic concrete; two 2-lane roadways with center separation. Bids on 2.1-mile section.

Date: Let Feb. 21, 1946.

Awarded to Macco Construction Company, Los Angeles.

Bid Details for successful bidder (A) and eight other bidders given below for selected items.

Bids submitted were:

(A) Macco Construction Co., Clearwater, \$1,141,080.

(B) James I. Barnes Construction Co., Santa Monica,

\$1,218,496.

(C) Griffith Co., Los Angeles, \$1,241,804.

(D) Warren Southwest and C. G. Willis & Sons, Los Angeles, \$1,278,986.

(E) Peter Kiewit Sons Co., Los Angeles, \$1,392,829.

(F) J. E. Haddock, Ltd., Pasadena, \$1,412,079.05.

(G) Guy F. Atkinson Co., Long Beach, \$1,436,000.

(H) Basich Bros. and Basich Bros. Construction Co., Los Angeles, \$1,493,476.50.

(I) Clyde W. Wood, Inc., North Hollywood, \$1,581,162.50.

Bid Item	A	B	C	D	E	F	G	H	I
1,200 cu. yd. remove concrete.....	\$ 3.00	\$ 4.00	\$ 4.50	\$ 3.00	\$ 4.20	\$ 4.85	\$ 2.50	\$ 6.50	\$ 3.00
58 acres clear and grub.....	50.00	50.00	150.00	35.00	85.00	66.00	40.00	75.00	100.00
14,500 cu. yd. roadway excav.....	.70	.50	.50	.40	.35	.70	.60	.45	.50
23,500 cu. yd. structural excav.....	2.00	2.30	3.15	1.20	2.50	5.15	2.00	2.50	4.50
4,700 cu. yd. ditch and channel excav.....	.70	1.20	.65	.60	1.75	.75	1.50	1.10	1.00
144,000 lin. ft. vertical holes and drains.....	.80	.85	.95	1.00	.80	.64	1.50	.90	.75
16,500 tons sand backfill, sand drains.....	2.00	1.50	2.20	2.25	1.85	3.50	3.00	2.00	2.90
680,000 tons imported borrow.....	.42	.55	.48	.465	.70	.66	.63	.70	.78
72,000 tons imported subgrade material.....	1.60	1.87	2.00	2.25	1.80	1.87	2.00	2.00	1.96
125,500 sq. yd. prepare class C subgrade.....	.10	.10	.11	.20	.10	.09	.10	.10	.10
Develop water supply and furnish water equipment.....	3,000.00	3,000.00	3,500.00	1,200.00	15,900.00	16,000.00	5,000.00	7,450.00	2,000.00
7,200 M gallons apply water.....	1.50	1.85	1.60	1.65	1.80	1.60	1.50	2.60	1.00
Finish roadway.....	2,500.00	2,000.00	1,500.00	1,850.00	2,500.00	4,500.00	4,000.00	6,500.00	4,500.00
290 tons liquid asphalt, RC-2, bit. surface treatment.....	15.00	15.00	19.00	15.40	19.00	12.25	16.00	17.50	16.00
24,000 sq. yd. prepare, mix and shape surface, bit. surface treatment.....	.15	.15	.10	.15	.14	.14	.10	.10	.15
2 tons liquid asphalt, SC-2, prime coat.....	50.00	20.00	30.00	30.00	30.00	27.50	35.00	130.00	50.00
540 tons plant mix surfacing.....	5.50	3.25	4.50	6.50	5.25	4.50	4.25	6.50	5.00
50,500 tons asphalt concrete.....	3.80	3.75	4.00	4.55	3.90	4.35	4.50	5.50	4.60
132 tons asphalt emulsion, curing seal and seal coat.....	25.00	17.50	22.00	21.00	25.00	21.50	25.00	22.00	30.00
330 cu. yd. portland cement concrete, pavement base.....	12.00	13.00	12.40	14.75	18.50	18.00	13.00	12.00	15.00
720 cu. yd. portland cement concrete, structures.....	30.00	30.00	40.00	46.25	54.00	40.00	55.00	75.00	65.00
315 tons gravel backfill, retaining wall foundations.....	2.00	1.80	2.90	3.50	3.00	3.60	2.60	2.50	3.50
400 lin. ft. rubber waterstops.....	2.00	2.00	2.25	2.50	2.50	1.30	2.00	4.00	2.00
30 sq. yd. membrane waterproofing.....	3.00	3.00	3.25	2.50	3.50	2.20	2.00	3.25	5.00
410 cu. yd. class C portland cement concrete pipe reinforcement.....	20.00	18.00	25.00	19.00	20.00	17.00	16.00	9.75	70.00
2,800 cu. yd. portland cement concrete, curbs and gutters.....	24.00	26.00	22.50	27.25	31.00	22.85	22.00	21.00	25.00
34,500 lin. ft. chain link fence.....	1.30	1.25	1.50	1.45	1.50	1.40	1.25	1.50	1.35
5 lin. ft. pipe shaft manholes.....	15.00	50.00	11.00	16.30	16.00	9.25	25.00	13.50	23.00
680 lin. ft. 12-in. plain concrete pipe.....	3.50	2.00	1.20	2.50	2.20	1.36	1.25	1.30	3.00
1,980 lin. ft. 15-in. same.....	4.50	2.30	1.50	2.85	2.50	1.75	1.50	1.70	4.00
90 lin. ft. 6-in. steel pipe conduit.....	2.00	6.00	2.30	3.70	3.00	1.10	6.00	3.00	3.50
3 each, adjust manholes to grade.....	125.00	100.00	30.00	10.50	100.00	30.00	30.00	25.00	60.00
50,000 lb. bar reinforced steel.....	.06	.06	.09	.075	.08	.078	.07	.09	.10
35,000 lb. miscellaneous iron and steel.....	.20	.15	.06	.12	.12	.17	.25	.20	.30
145,000 each mesembryanthemum edule cuttings.....	.03	.03	.04	.05	.04	.032	.035	.06	.08
Electric equipment.....	8,000.00	9,000.00	9,000.00	5,035.00	10,000.00	13,400.00	12,000.00	14,000.00	12,000.00
Pump house and pumping equipment.....	5,000.00	6,000.00	4,400.00	7,625.00	5,200.00	3,300.00	7,266.00	14,000.00	12,500.00

Not tabulated are items for approx. 7,000 lin. ft. concrete pipe of various sizes.



★ Platform and pipe set on the original ground for measuring subsidence. Sections of pipe will be threaded up through the fill as the height builds up

backfill (sand drain) to be paid for will be determined by weighing as provided in Section 9, article (a), of the Standard Specifications.

The price paid per lineal foot for vertical holes (sand drains) and the price paid per ton for sand backfill (sand drains) shall include full compensation for furnishing all labor, materials, tools and equipment and for doing all work involved in preparing the holes, furnishing and placing sand backfill and disposing of material removed from the holes, as above specified.

Sand Fill Material.—A layer of imported sand fill material shall be placed over the top of the vertical sand drains. This layer shall cover the entire area where sand drains have been placed, shall extend to the outer slopes of the embankment and shall have a depth of 2 ft.

Sand fill material shall consist of clean, coarse sand or gravel conforming to the following grading requirements:

Sieve Size	Percentage Passing Sieve
5/8"	80 to 100
No. 8	5 to 50
No. 30	0 to 20
No. 50	0 to 5

Prior to placing the sand fill material, the layer of imported borrow used as a working table shall be bladed to a smooth plane and shall expose clean sand backfill material in the top of each sand drain to insure free drainage connections between the sand drains and the sand fill material. If the top of any of the sand drains are clogged or if the backfill material has become mixed with unsuitable material, the top of such sand drains shall be cleaned out before placing sand fill material. Sand fill material shall be placed in one layer

by end dumping and spreading in a manner which will not disturb the vertical sand drains. The next layer of embankment material spread over the sand fill material shall be approximately 8 in. thick and shall be placed by end dumping and spreading before rolling in such a manner that it will not become mixed with or displace the underlying layer of sand fill material. The remainder of the embankment shall then be constructed in accordance with standard specifications.

Sand fill material will be measured and paid for by the ton (standard specifications), which price shall include full compensation for furnishing all labor, materials, tools and equipment, and doing all work involved in placing the sand fill material as above provided.

Kentucky Expands Employee Safety Program

BELIEVING that the precepts of safety begin at home, the safety section of the Kentucky Department of Highways has been reorganized for greater efficiency. Seven inspector posts will be set up in highway districts. The unit will operate directly under the supervision of Thomas H. Cutler, state highway engineer, with J. W. Knox, safety engineer, directing the program. The department operates 123 garages with the responsibility for 2,988 pieces of mobile equipment. The selecting of safe drivers and the advancement of safety precautions among mechanics and workmen will be an important step toward safety.

Mr. Cutler in a letter to "Roads and Streets" states that the reorganization of the safety section is, in effect, the expansion of that division to the point where it can effectively carry out the needs of the department. This

is now possible because of the availability of personnel following the close of the war.

The duties of the seven trained Safety Inspectors will be largely educational. They will spend at least one day each month in every county. The three greatest causes of injuries and accidents to department employees and equipment are careless driving, poor housekeeping and fires, so naturally a preventative program against these three causes will be vigorously prosecuted.

The department requires a physical examination for each applicant. Every county in the state has a medical examiner and it is his duty to make a pre-employment physical examination and report before the applicant can be considered for employment. Also, the medical examiner is used as a department doctor in the event of injury to an employee, but this does not deny the injured person the right to use his family doctor if he so desires. As a result, health practices and better work conditions are a goal toward which the department is working.

Commissioner J. Stephen Watkins in announcing this expansion, said: "Our men should set an example. Inspectors will carry on educational programs, keep a close check upon the health and physical condition of employees, investigate injuries and accidents within the department and direct better compliance with fire prevention rules."

Indian Engineers Visit U. S.—A delegation of 24 engineers from India, all of whom are public works officials in the national, provincial or municipal governments in their country, arrived in Washington, D. C., on July 30. They will spend three months in this country studying road building methods.

AGC Officers at Denver Summer Meeting



H. J. Kirk, manager, AGC Highway Contractors' Division; Morris E. DeWitt, Poplar Bluff, Missouri, chairman; F. W. Parrott, AGC vice president. (Right): AGC officers: president W. S. Bellows, and managing director H. E. Foreman.

Senior executives from contractor organizations representing AGC's 3,800 member contractors pledged full cooperation to help prevent unjustifiable rises in construction costs.

Left Turn Accidents

A study of accident frequencies occasioned by left turns on four-lane divided highways

By R. H. Baldock

State Highway Engineer of Oregon, Salem

THIS study was made to determine if there existed a relationship between accident frequencies and left-turn volumes—relative to the advisability of providing left-turn refuges on four-lane divided highways for small left-turn volumes. It was the belief of the Traffic Engineering Division that the infrequent left turn created as great, if not a greater hazard, than the frequent left turn. This was based purely upon supposition derived from personal observation. However, it was felt advisable to study the accident records over a period of years in order to determine through the use of factual data the actual experience. For the purpose of this study two four-lane divided highways were studied. The two highways studied were:

US99E—McLoughlin Boulevard—from the Portland city limits to the Oregon City city limits.

US99W—Interstate Avenue—within the City of Portland from N. Denver Ave. and N. Argyle St. to N. Russell St.

The first of these two highways is delineated through the use of a four-foot asphaltic medial strip with "jiggle bars" while the latter has a six-foot raised concrete medial island.

Source of Data

The accident records in the Traffic Engineering Division were used to the end that all accidents occurring on both of the sections studied were analyzed so that only those accidents caused by a left turn could be determined. These accidents are basically

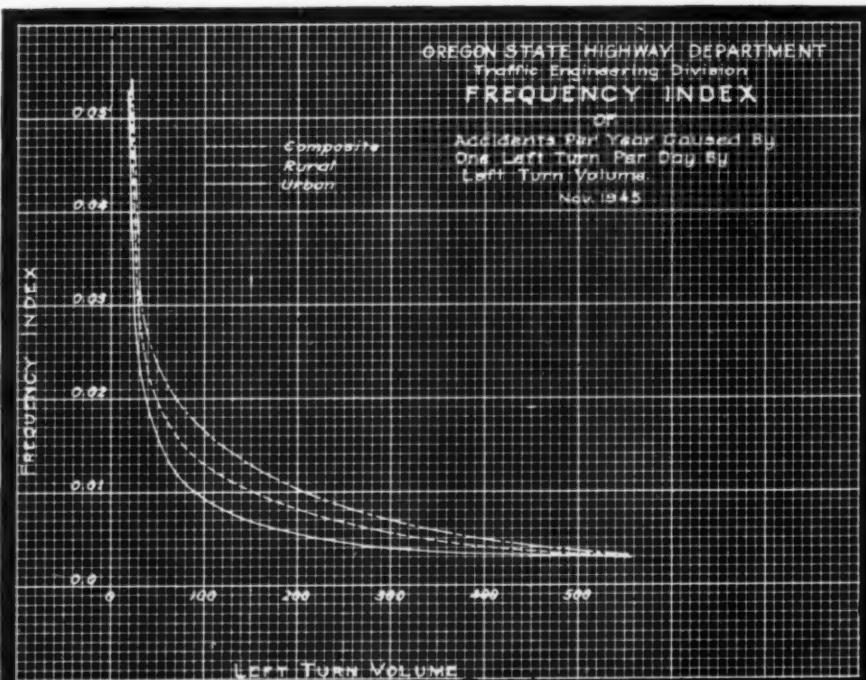
of two types, the first being the rear end caused by the vehicle making the left turn stopping in the moving lane of traffic and the second being a turning movement collision caused by the left turn striking or being struck by the opposing through movement. In order to correlate these accident data with traffic volumes, traffic density counts previously made were analyzed and the number of left turns—leaving the highway—at every intersection were determined.

US99E—McLoughlin Boulevard—is 44 ft. wide with four 10-ft. traffic lanes and one 4-ft. medial divider with "jiggle bars." The pavement is

of portland cement concrete except the medial divider which is of asphaltic concrete. It has 10-ft. graveled shoulders and no provisions for acceleration, deceleration lanes or left-turn refuges. This highway has a through volume in either direction of approximately 3,000 vehicles per day with an average speed of approximately 40 mph. Some 25 intersecting roads were studied along this section of highway.

US99W—Interstate Avenue—is a 60-ft. street, curb to curb, with a 5-ft. raised medial divider, two 7.5-ft. parking lanes and four 10-ft. traffic lanes. No provision on this street is made

(Continued on page 121)



Vehicle Accidents Caused by Left Turns on 4-Lane Divided Highways

By Oregon State Highway Department, Traffic Engineering Division, November, 1945

Traffic Volume Group	RURAL Left Turn Volume VL	HIGHWAY Accidents AL	SECTION Frequency Index F	URBAN Left Turn Volume VL	HIGHWAY Accidents AL	SECTION Frequency Index F	COMPOSITE Left Turn Volume VL	HIGHWAY Accidents AL	SECTION Frequency Index F
0—49	15	0.6	0.040	28	1.0	0.036	18	0.7	0.039
50—99	78	1.5	0.019	66	0.3	0.005	72	0.9	0.013
100—199	150	2.0	0.013	135	1.2	0.009	139	1.4	0.010
200—299	207	2.0	0.010	288	0	0	248	1.0	0.004
300—399 .....	...	..	..	385	4.7	0.012	355	4.7	0.012
400—499 .....	...	..	..	487	3.0	0.006	487	3.0	0.006
500 & over	1,464	4.0	0.003	1,364	3.7	0.003	1,389	4.5	0.003

VL = Average left turn volume per day.

AL = Accidents per year caused by left turns.

F = Frequency Index—frequency of accidents per year caused by one left turn per day (when made for one year).

EDITORIAL

★ Snafued Surplus Equipment + Delayed Manufacturer Deliveries

By H. K. Glidden

... Equals high construction cost. In discussing the contractors' lot with a top official of a state highway department, in a state where things are going along comparatively well, several interesting statements were made. It is felt that these statements shed some light on the currently bad construction price situation.

The first statement was to the effect that there are no first class contractors in this state who need more work than they have presently under contract. The first impression was that a fine state of affairs existed and that things surely must be better than we thought. Before we became complacent about the situation, we learned that these same contractors would ordinarily have handled a great deal more work but that they could not get the equipment to do it with. In effect their efficiency has been reduced greatly both because of the scarcity of new equipment and the lack of parts for their old equipment.

After recently watching a number of jobs where ingenuity on the contractor's part is making some old-time equipment function well enough not to be conspicuous, we were hardly prepared for the next statement. This official expressed the opinion that while bid prices are very high, the contractors are not making much money. He credited this situation to the fact that there is so much lost motion in trying to make worn out equipment do the job that efficient organization is impossible.

Hand in hand with lack of equipment he blamed the uncertainty of delivery of materials. An instance was cited where a contractor bid in a soil-cement job at a good price on the basis of an October 31 limit on placing surface course materials. It looked like money in the bank until it developed that he couldn't get culvert pipe until late in August. Unless the contractor can whip this one, his job runs over into next year and he also has to absorb the overhead between now and the time he can start the job. He classifies any structure as a long odds gamble.

The government's disposal of surplus equipment then came in for discussion and the statements soon got completely out of the literary category. The experience of this state can be summed up in the simple statement that they have so far received very little surplus equipment, regardless of their close connection with the federal government. Army trucks are not held in very high regard by them because they are not standard throughout and are mostly four-wheel drive. This state would like to get a large number of surplus motor graders and pieces of loading equipment. The impression was gained that they are not at all optimistic, however.

Giving up the idea of securing surplus equipment, the talk turned to delivery of new equipment by manufacturers. Included in four million dollars' worth of equipment on order were 1200 trucks. Fifty have come through despite a fancy delivery schedule. Many equipment purchase orders were issued which contained no escalator clauses. Regardless of this, the distributor is predicated on early delivery on the state absorbing increased costs which have occurred since the order was placed. The Attorney General will not approve this even though reordering involves payment of these same increased costs as well as additional delay.

As the talk went along it was easy to translate this state's experiences

into terms applicable to the highway contractors. They are both practically out of business as far as both new construction and maintenance are concerned. They cannot quit so both of them will go on patching and improving. It will cost each of them a lot more per unit of work to do it this way, but there is no alternative.

"Carry home pay" is an expression that did wonders for some labor unions. Maybe it will work as well for the contractors. It is probably too complicated in their case, but it is believed that if the government has not been able to prevent the disposal of surplus property getting into such a state that the Associated Equipment Distributors feel called on to describe it as "chaotic," it might at least recognize its own handiwork in the high cost of construction. Surplus equipment could well have bridged the gap between V-J Day and the day when the manufacturer can deliver. Present indications are that surplus equipment will probably show up in quantity about the time so doing will foul up the distributors' market.

It is utterly useless to advise a bureaucracy to mend its ways and let this equipment get into circulation right away, but some good may result from calling the attention of the public officials and engineers to one more specific reason why 1941 prices and engineers' estimates are not acceptable yardsticks nowadays.

★ New Housing Means New Parking Problems

The National Committee on Housing, Inc., has rendered a public service by a symposium which spotlights phases of housing planning that have to do with congestion relief in our cities. It urges cities to review and if necessary revise their zoning ordinances, if possible before a real home building boom gets under way. This is important because where zoning is inadequate a big volume of new construction will tend to make zoning show up all the worse. Traffic conges-

tion is now at an all-time peak in most cities, and the urban blight and decentralization continue to take toll of central-city property values. This certainly is due in part to lack of planned, organic growth.

Of timely national interest is the new Los Angeles ordinance, which was voted early this year to cope with that city's large wartime growth. As discussed by Los Angeles' planning director, Charles B. Bennett, it contains several pioneer ideas. What

particularly strikes our eye is the drastic requirement for automobile parking and storage space, intended to relieve congestion on city streets. The requirements call for a garage space for each new dwelling unit, and for off-street parking space for each new commercial building above a certain size.

Elimination of stored and long-parked cars along city streets is one of the seemingly unsolvable problems. But at least the condition can be prevented in new community areas from here on. Even where lots are narrow and alleys absent, as is necessary in close-in areas, skillful architectural treatment can solve the problem of

where to put the family car. In San Francisco, for example, the garage is commonly put where the front door to the living room used to be. You drive into the front of your home, which is functionally right for this motor age and why not popularize the arrangement more widely?

★ Markings Are Too Confusing

We cannot help wondering, as we drive the nation's highways, just what the average tourist thinks when he sees a broken white line down the middle of the pavement suddenly turn into some combination of solid and broken lines or into two solid lines. If he thinks at all, he may try to recall what it said in the little book he used in cramming for his driver's license test. Assuming that he tries to figure it out, with possibly the aid of an occasional sign to the effect that it is unlawful to cross the solid line when it is in his lane, it seems logical that he will give it all up as a bad job when he crosses a state line and finds no stripes at all or else some other combination of stripes.

Highway safety depends on many things other than carefully worked out alignments and highway markings. Good design and planning will make it harder for the driver to get himself into trouble, but until consistency is attained and the driver educated to understand the signs he is going to continue to get himself killed trying to pass on a hill or curve.

In talking with various state highway safety and planning engineers, we have found their talk about sight distances especially interesting. We have found that when you get one of them to talking about his work that you are in for a pleasant half-hour or so. Their differences of opinion among themselves seem to involve only minor details, and they are consistently sold on their job. We believe the public would also like to hear something on this subject.

The American Association of State Highway Officials has taken up the matter of securing uniform highway marking throughout the nation and they are to be commended for this forward-looking step. We feel, however, that the entire burden should not be left to them. Paint is rapidly becoming available and large amounts of money will soon be spent to catch up on wartime-neglected markings. New signs are in order. Now appears to be the right time for concerted action. It will surely cost a lot of money to attain a uniform marking system a year or so hence. It seems

logical that economic pressure will build up increasing resistance to any move which will require so much work.

The President's recent safety conference is a splendid example of the public interest in safety matters. It will be too bad if the steps taken to carry out the program he outlined do not include the early adoption of uniform highway markings and an educational program. Our idea of the educational program is one that will leave the driving public fully informed, not only as to what the stripes mean, but also why it has every reason to heed their life-saving message.

America is doing marvels in the way of loading her highways up with left-over prewar automobiles and the new ones are increasing the congestion. We certainly have a new crop of drivers and all of them want to see America in a hurry. We feel that our admonition to educate these new drivers and bring the old ones up to date and to give both of them as nearly fool-proof highway guidance as possible is timely if not belated. Cross country driving is certainly a revelation of these needs and the accidents and near accidents we witness call for action right away.

★ Fewer Accidents; Can It Be?

From the National Safety Council comes news that the month of May this year witnessed a drop of 21% in the national traffic accident rate as compared with May, 1941. This encouraging reduction occurred in spite of the fact the volume of travel has sprung back to an all-time-high level in most localities.

It is more than just a coincidence, we feel, that this drop occurred in the period just preceding and following the highly publicized President's Highway Safety Conference in Washington. Whether this trend will be permanent will depend on the persistence with which all agencies carry out sustained programs in the various communities and jurisdictions. Three states have already held safety conferences similar to the one in Washington and fourteen states

have such conferences set for an early date. Considering the rather lengthy and thorough pre-planning which must precede such conferences to insure their effectiveness, this is good progress indeed.

While admitting that elimination of driver carelessness, speed control and other elements of enforcement and education come first, we must also restate the fact that safe highway design must gradually carry more and more of the responsibilities. Building safety into a highway sometimes adds considerably to its first cost, and highway engineers must resist compromises and constantly seek to incorporate the best design thinking. Examples of such thinking will be presented in "Roads and Streets" in the near future.

★ Hot Weather Musings

As we go to press we make a silent but fervent wish: OPA, please don't back, and if you do come back, leave the construction industry alone. Old man competition and the law of supply and demand will take care of us better. It is encouraging to note that some of the cement companies, for example, are pledging themselves to keep prices strictly in line with costs of manufacture and delivery, regard-

less of the future of government price control.

Many millions of dollars' worth of road projects lie mouldering in rolled up blue prints today because little boys in Washington have been monkeying with our economics. What we need now is machinery and materials, even worse than we need engineers and construction workers.

JOB and EQUIPMENT IDEAS

Send in your contributions to this idea exchange and help road building progress. ROADS AND STREETS will pay a minimum of \$10.00 each for any publishable field or office methods or shop kinks. Why not pass this along to your staff and encourage them to send in brief "how we did it" descriptions, rough sketches or snapshots.

Truck Shovel Handy Unit on Mountain Road Maintenance

The three photographs shown here illustrate well the usefulness of a truck-mounted shovel in highway maintenance. This unit, owned by the

Colorado state highway department, is being used by the maintenance crew to clean out ditches and drainage structures, high up on U. S. 40 near Berthoud Pass west of Denver.

1. A big rock had fallen into the drop inlet and blocked this pipe culvert. Quick, Watson, the truck-shovel,

which is here seen lifting out said rock with a wire rope sling fastened to the dipper lip.

2. Heave-ho! The truck-shovel could have taken the boulder over to the embankment and heaved it, but a truck was handy.

3. Stone out of the way, the shovel does a bit of ditch cleaning before leaving the vicinity. Much of the efficiency of the Colorado state highway maintenance force is due to the policy of doing a lot of little chores as they go along.

In addition to cleaning out culvert inlets and opening up side ditches, this shovel also serves for stockpiling materials and loading into trucks for patch graveling, and now and then goes about the business of cleaning up small slides and nosing aside large rocks that have fallen. D. N. Stewart is superintendent of maintenance.

Job Safety Suggestions

1. Wear goggles when chipping concrete or stone, dumping cement bags, operating power saws and doing all other jobs in which the eyes are exposed to danger.



★ Photo 1



★ Photo 2



★ Photo 3

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2. Use an approved respirator when handling cement.

3. Wear good shoes with heavy soles to protect your feet. Safety shoes with hard toes are recommended.

4. Be careful of untied shoe laces or baggy trouser cuffs.

5. Wear heavy gloves when handling jagged, sharp or splintered material.

6. To prevent burns from cement, use proper grease on exposed parts.

7. Drink plenty of water. In hot weather use salt tablets.

Truck Crane Unreels Heavy Cable, Sets Precast Manholes

Five cu. yd. capacity shovels such as the one shown here use large diameter cable. Geo. M. Brewster & Son, Inc., of Bogota, N. J., used 1½ in. cable in the 4 shovels of this type which they had on the Wilkes-Barre Scranton airport job. A roll of this cable weighs about 6,000 lb. and can be tough to handle. One of the photos shows how Brewster's men used a truck crane to unreel this heavy cable.

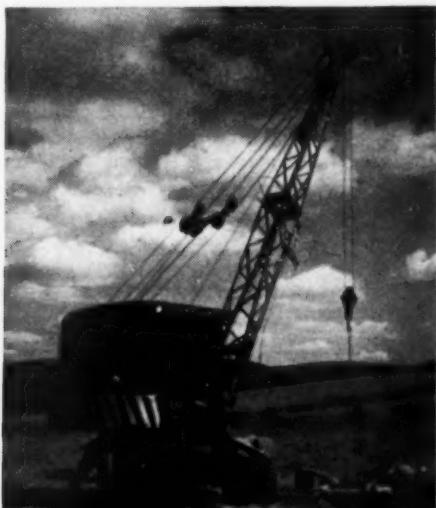
This same airport project had about 46 manholes of the type shown in the drainage system. Additional photographs on this page show how the same truck crane made easy work of placing the pre-cast manhole covers. Note the reinforcing steel rings cast in the concrete and the simple sling which connects them to the crane's snatch block. The truck shown in photograph 3 carried as many as 6 covers at one time.



Road Forms for Building Foundation

When the contractors on Los Angeles' new Santa Ana Freeway had to build a small building near the project, they cast about for a bit of form lumber for pouring the foundation. Why not use steel road forms,

someone suggested, since better than a mile of forms were stacked nearby. They served the purpose well, as indicated by the photos snapped by your Editor. The scenes show forms in place, forms partly removed, and finisher at work on the rough spots with a gasoline powered surface grinder. Peter Kiewit Sons', contractor.



A National Program for Secondary Road Development

This remarkably comprehensive and thoughtful review was presented at the annual meeting of the National Association of County Officers, held in June, at Cincinnati. Contractors as well as highway engineers will find it to their interest to read this message, as it outlines the pattern by which millions of dollars will be spent on secondary highways

By Thos. H. MacDonald

Commissioner of Public Roads,
Washington, D. C.

HERE is provided in the Federal Highway Act of 1944 a three-way plan of action to establish a program for the nation-wide development of secondary roads. This is a long-range undertaking. The conditions to be met vary between wide extremes. At first thought, a reasonably uniform concept, universally applicable, appears difficult, and perhaps to many impracticable. Such, however, is not true, for we have an unfailing guide.

"The justification for the expenditure of public money in the improvement of the highway must be found in the traffic itself. Not only the present amount of traffic on the road, but also the amount it would be increased by improved conditions, should be taken into account."

"The volume of traffic over the public roads on which is based their value to the community through which they pass, can only be estimated by totaling the amount which each individual uses the road."

"It will be seen that the important traffic, from the standpoint of road improvement, is not the heavy hauling, but rather the light travel."

"If through road improvement he (the average farmer) is enabled to haul a larger load, the actual money saved would not be an enormous sum, as has been claimed by many enthusiasts writing on this subject and who have deduced their estimates from data manifestly inadequate.

"The travel to market and other light travel are without doubt the most important classes of traffic which the public roads carry, and the value of improvements must be based largely on the stimulus and beneficial results it gives to these two classes."

These are excerpts from the 1906 revision of the "Manual for Iowa



Highway Officers." Since its issue, forty years of highway history have passed. They are not statements of theory as of that time, but are the principles which resulted from surveys which secured from each farm family the facts as to their daily and yearly use of the rural roads. There was not to my knowledge a motor vehicle on a single farm in the state. These principles are as valid today when there are totally changed types of vehicles upon the roads, and many times multiplied miles of travel over them. They indicate how persistent is the pattern of highway transport necessary to the individual whose home and occupation are on the farm. While the mileage which he uses the road has been multiplied many times, the pattern of his daily use remains constant. This is the reason that we may have faith in the future program for the development of rural highways, for the new program is based upon a determination of just how people who are dependent on them need to use the roads. In passing, it may be remarked that such a determination is the antithesis of regimentation. It fits the roads to the public. It does not attempt to fit the public to the roads.

Selection of Secondary Systems

There are in excess of 3 million miles of public roads in the United States. There are many laws, state and local, and many jurisdictions over segments of the whole, which have all too fre-

quently operated independently. It has none-the-less long been accepted by road officials that to insure progress in improvement consistent with the need, it is essential that this over-all mileage be segregated into systems. The beneficial results accruing from such a course have been amply demonstrated by the Federal-aid system, the state highway systems, and in many counties where classification based on relative importance is in effect.

In the regulations for the selection of the secondary road systems which were developed by the Public Roads Administration in cooperation with state highway officials and county engineer consultants, no mileage limitation was placed on the extent of the state systems of secondary roads. There are two principal requirements; first, that the selection of secondary roads shall constitute an integrated system within themselves and with the primary roads of the state, and second, that the extent of the system shall be consistent with the anticipated finances available for their construction and maintenance.

Up to the first of June, 43 states, the District of Columbia and Puerto Rico had submitted systems which have been approved, totaling 200,241 miles, and there were under review 85,775 miles, a total of 286,016 miles.

While there have been received in Washington from a few states complaints that the county officials were not adequately consulted in the selection of the systems by the state highway departments, such complaints have been very few. For the 200,000 miles plus which have been approved, evidence has been submitted by the state departments that the submissions are in accord with the state law and that the local officials had been accorded their legal prerogatives.

The reassuring element in the selection of this immense mileage is that

the choice has been predicated upon the detailed studies of the highway planning surveys. This should not be construed to mean, however, that existing traffic volume is the only, or even the most important, criterion. While the yard-stick of traffic volume reasonably fixes the relative service requirements of the Federal-aid and State highways, service for the land and for the development of natural resources, such as mines and timber, must be given equal weight in the selection of the secondary road system. The ultimate goal is to extend service of an adequate character to every farm home or substantial source of raw materials needed for production. Currently, the extent of the systems has been determined on a State-wide basis with the mileage allocated to the counties or local road jurisdictions on the basis of formulae reflecting various factors. The application of such formulae has been necessary as an expedient to permit immediate action, but there lies ahead the need for the revision of the systems, county by county. This revision must be directed toward the goal of a completely adequate system of secondary roads, but the rate at which this desirable end can be reached will depend upon the individual county's financial resources, supplemented by state and federal funds.

It is apparent that the selection of secondary systems is a continuing undertaking. It must not be permitted to become static. As stated, the regulations did not limit the mileage to be included in these secondary systems. As rapidly as possible the mileage that can be built to adequate standards and maintained with the income available, must be determined for county units. The one important thing is the maintenance of full co-operation between local, state and federal officials administering this work.

Secondary Road Programs

While the selection of the systems has been in progress, the construction programs of projects have been formulated. As of June 1st, 2,851 projects, estimated to cost \$217,000,000 for more than 12,000 miles of road, have been included in the going program. The funds include prewar balances and the new postwar secondary funds. As of the same date, including the funds recently allocated for the fiscal year 1947, there is an unprogrammed balance of \$209,000,000 of federal funds alone.

While it is purely speculative, it will reduce to somewhat concrete terms the progress that may be expected in the improvement of the

secondary systems if we carry the estimates ahead based on existing figures. At the estimated over-all cost for 12,000 miles in the going program, the available federal funds plus state funds will provide for an additional 23,000 miles, which, together with the current program, would improve approximately one-eighth of the presently recommended mileage of 286,000 for the secondary road systems.

Probably at some time in the future I shall be embarrassed by someone repeating the above figures wholly divorced from the purely speculative aspects with which they are qualified.

At the present time the emphasis is on the housing program, and the fact that we have had five years of rapid road deterioration, lack of replacements and a curtailed maintenance program with equipment in bad repair, is pushed aside. This is intended in no way as a criticism of the housing program, but road maintenance and construction conflict very slightly, if reduced to realities, with the housing program. My own fear is that we will pay heavily in loss of life and property damages, not only in the months ahead but in the acceleration of these penalties when the quantities of new vehicles roll off the assembly lines. This is the nightmare of road officials everywhere.

Road Standards

Speaking of nightmares, this is a good time to lay a ghost—the ghost that confronts us so frequently that the Public Roads Administration demands too high standards. Actually, the only standards for secondary roads ever issued by Public Roads, with the exception of the two details of width of grading and width of permanent bridges, are the standards adopted August 1, 1945. These standards were developed by the Design Committee of the American Association of State Highway Officials and Public Roads, and the minimums included are probably open to the criticism that they are too low rather than too high. At least that is the conclusion of the Board of County Engineer Consultants appointed by Public Roads to reflect the viewpoint of the county officials. Their work has been of tremendous value already, but it is only starting. Given a little time and reasonable patience, acting in co-operation with this Board, Public Roads will endeavor to reach and remedy the causes of every legitimate complaint. The appointment of this Board is no passing gesture. We have the same respect for, and confidence in, this Board of county engineers representing every division, that we have in our own personnel. These

Mail Inserted Card or Inquiry Blank (page 128) for Equipment Data

Again this issue of *Roads and Streets* carries descriptions of many new labor-saving efficiency devices and latest material developments. See our Post-war Parade beginning on page 113, for which a numbered reply card has been inserted to help you request data on items that interest you. Also on page 128 is an inquiry blank and advertisers' index which will help you get data on equipment and materials you need.

standards have previously been brought to the attention of your Association, and no criticism has been voiced. This does not mean that any of us think there has been no misapplication of standards. The problem is not lowered improvement standards, but higher administrative and technical competency in their application. This we hope to assist in bringing about, although it will take time, through the establishment of a division dealing exclusively with this field of operation.

One fact should be inserted right here. It is characteristic of our Federal-aid secondary road projects that they include many bridges. The most enduring assets we have in our roads are permanent bridges, and it is not economy to build short-lived structures. The inclusion of the cost of long-lived structures, however, materially raises the average cost per mile of Federal-aid secondary road construction. Federal-aid construction costs are frequently compared with costs of other secondary roads from which the cost of bridges has been omitted. Obviously such comparisons are unsound.

Secondary Road Financing

Prior to the advent of motor vehicle traffic and the consequent earnings from road users taxes, all highway construction was supported by revenues derived from property taxes. Since then there has been a constant replacement of road income from the property sources by the income from the road user. The year of greatest revenue from the property source was 1928, when the total amounted to \$499,000,000. As late as 1931 this total amounted to \$459,000,000, but

(Continued on page 99)

Mudjacking in Texas

Over 150 miles of pavement successfully treated with a mixture of loam, RC-2 cutback, portland cement and water

By M. B. Hodges

District Engineer
Texas State Highway Department,
Yoakum, Texas

REGARDLESS of the causes, it is a well known fact that many miles of concrete pavements are in various stages of deterioration and, in some instances, almost complete failure. Many and varied are the reasons given for this condition. Among them are heavy truck traffic during the war era; continuation of this same type of traffic; inadequate design for present day traffic; plastic soils; inadequate maintenance; either too few or too many expansion and dummy joints; entrance of surface water through cracks and joints, and various other reasons. It is thought that many of those responsible for the maintenance of our highways will readily admit their share of the responsibility in not properly maintaining concrete pavements. In any case, we know that they have failed, are continuing to fail, and will continue to do so in the future unless immediate steps are taken to restore them, as far as humanly possible, to their original state. It is clearly up to those responsible for maintenance to do all that is possible, and outlined below is the method, or methods, being used in District 13 of the Texas State Highway Department in the restoration of more than 500 miles of concrete pavements.

Many Soil Types

The soils in this area vary from sandy loams to the heavy plastic type. Failures are to be found on all types. Pumping at cracks and at expansion, dummy, and longitudinal joints is to be found on more than one-half the mileage. On the remaining mileage, the pavements are in fair to good condition, but, in many instances, badly cracked but for some unknown reason the pumping action has not as yet started. Settlements and warping are also prevalent over a greater percentage of the mileage. On one section of U. S. Highway 77 south of Victoria a crack survey reveals one at intervals of about 5 ft. with the usual disintegration. The burning question was what to do, as we could not sit idly by and continue to watch this deterioration and disintegration which was rapidly becoming worse.

Tried Various Methods

It had been my privilege to have inspected various methods being used in the past in an attempt to preserve the riding surface and also methods being used to seal off the surface water which was entering through joints and cracks. In years gone by, mudjacks had been in use to preserve the riding surface but with rather disastrous results in many sections. The holes drilled were $2\frac{1}{2}$ in. in diameter and resulted in some rather bad spalling underneath the pavement

which materially weakened the strength of the slab. The slurry used was portland cement with loams, but was rather stiff, causing stooling or pedestaling. An alternate method to preserve the riding surface was by the use of various types of asphaltic concrete. In other instances, three or four of the Texas highway districts had resorted to the use of AC-30 as an underseal, while one district was using a slurry composed of portland cement and cutback asphalt for a dual purpose—to restore the riding surface and, at the same time, underseal and protect the subgrade from the entrance of surface water. This latter method seemed to have more merit than any of the others, and in May, 1945, we inaugurated in this district a rather extensive program of mudjacking.

Prior to the beginning of the work, various combinations of cement and cutback were mixed with loam soils and samples were sent to the main laboratory in Austin for tests. We were attempting to secure a mixture that would remain semi-plastic for an indefinite period of time, would have ample stability, and would also be water repellent. After rather exhaustive tests, it was found that a loam having a plasticity index of 0-2 mixed with 80 gal. of RC-2 cutback asphalt, one bag of portland cement, and about 80 gal. of water per cubic yard of material would serve these three purposes.



★ Equipment necessary for normal operation. From left to right: Truck carrying loam and cement but not attached to the mudjack machine; the mudjack machine; asphalt heater; water tank and small power unit for towing the last three units which are connected

★ Drilling is performed well in advance of the mudjacking



★ This device is used for a dual purpose. It prevents the drill from bouncing around on the pavement and insures a rather round hole at the surface. In case of a breakage of the drill stem, it may also save a badly injured foot, or toes. Note also the steel shoes which are being worn for vital protection of the feet

Since May, 1945, we have mudjacked approximately 150 miles of pavement and the results to date have been very satisfactory. Only time will enable us to fully determine whether or not the material being used is serving as we are hoping it will. We do know, however, that the riding surfaces have been improved beyond our expectations and, in no instance to date, have we found the recurrence of pumping in the areas which have been mudjacked. Failed sections were removed and replaced with portland cement concrete. No patch was placed which was less than 4 ft. in one dimension or of an area less than 24 sq. ft.

Mudjacking Equipment

The equipment necessary for the operation of a unit consists of a mud-jack machine; an air compressor of sufficient capacity to operate two jack hammers; a water tank with a capacity of 1,000 gal.; an asphalt heater of not less than 600 gal. capacity; two trucks to haul the loam and cement; and the usual small tools necessary for the operation. The water



★ A typical scene showing the hose line fully extended across the pavement. Note hose being supported by dollies on casters, which facilitates moving hose around

and asphalt tanks should be of the above capacities so that it will not be necessary for refilling either during the morning or afternoon. We refill them during the lunch hour to expedite the work and for economy reasons. A crew of ten to twelve men is necessary for efficient operation of a unit.

Prior to the beginning of the work, the foreman carefully inspects the section to be treated and marks all areas. A crew starts drilling the holes, using drills of 1½-in. diameter. After three or four days of drilling, mudjacking operations are started. All areas showing any evidence of pumping, or displacement at joints and cracks and warping, are mudjacked. All asphaltic concrete patches previously placed to improve the riding surface are removed and the slab is brought back to its original grade and section. In many instances, such

areas may be rather short in distance and isolated. In a few instances, it is necessary to mudjack each square foot of the pavement.

String Line Check

To secure a smooth riding surface, it is necessary that a string line be used to which the pavement is mudjacked. We use a steel wire which is drawn taut and have found the method very satisfactory. In some few instances, we have encountered frozen joints. In such cases a pneumatic spade is used to open the joint for a width of about 2 in. We also find that, in some instances, due to the fluidity of the slurry, when operations are started, one portion of a slab will start rising while that portion which we are attempting to raise remains stationary. Under such conditions a weighted or loaded truck placed on the section already to grade

In addition to summarizing mudjacking methods which seem to be successful, Mr. Hodges makes some candid observations on concrete pavement service and the need for better maintenance and for modification in design. In view of the excellent and economical performance of concrete roads in various states, many readers may differ in their views from statements made at the beginning and close of this article. Comments welcome. — EDITORS.



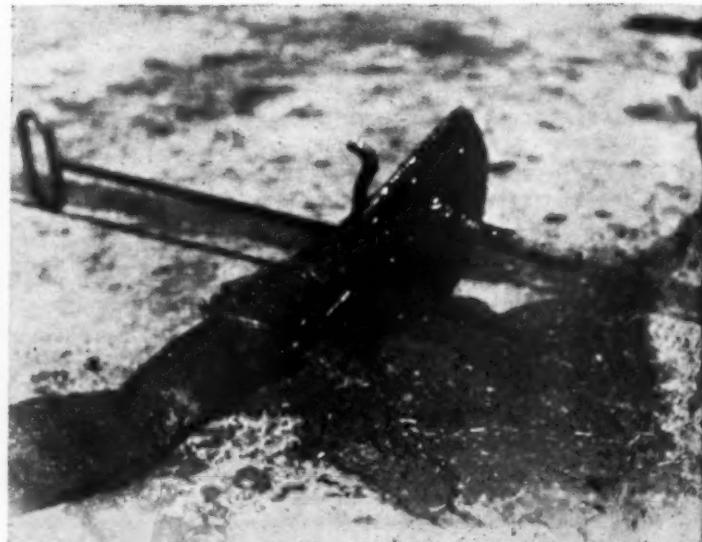
★ Old asphaltic concrete patches are removed from the pavement by means of motor patrol graders. In some instances it is necessary that these patches be soaked with kerosene, or a light fuel oil, before blading. If the patch is very tight it may be necessary to ignite the oil, which loosens the material



★ Holes drilled well in advance of the operation may become filled with dirt. We find it very important that a man be sent ahead to insure that the holes are open to a point well beneath the bottom of the slab. This is accomplished as shown. Water is first placed in the hole after which a bar is rammed into the hole several times to insure that it is open (Author)



★ After removal of the nozzle, a back pressure will cause the slurry to exude. Short plugs are used to prevent this extrusion as shown here



★ A closeup of one nozzle being used. This is merely a 1-in. pipe, not tapered. A sleeve, or shoulder, is placed underneath the shield, or platform, which rests on the pavement and prevents the extrusion of the slurry while being pumped

will correct the condition. We cannot emphasize too strongly the use of a very thin slurry which not only prevents stooling or pedestaling but also

permeates every cavity underneath the pavement regardless of its thickness.

When we first started this type of

work, the cost was comparatively high and the progress was slow. Our men had never performed work of this nature and their inexperience was the cause. At the beginning, we thought we had performed a good day's work if we placed as much as 10 cu. yd. of material underneath the pavement. At the present time we are mudjacking from 15 to 20 cu. yd. of material each day and the cost is about one-half the cost of an equivalent amount of AC-30. We have raised pavements from a fraction of



★ After removal of some asphaltic concrete patches, it was found that the concrete pavement at this point was as much as 4 in. lower than the paved shoulders

an inch to 11 inches, but in those cases where the pavements must be raised more than 2 or 3 in. the work is performed in two or more operations to prevent additional cracking of the pavement. It might be added that, in no instance, have we found that the operations as being performed in this district have caused any additional cracking. We have six mudjack machines at work in the district and will continue with the work until we have mudjacked that portion of the mileage which we think necessary.

Continuous Maintenance Urged

After completion of the work, it will likely be necessary to continue the use of machines for a period of a few days each month to maintain the riding surface and seal off the surface water on those areas which show evidence of pumping. In other words, it is our thought that by continuous maintenance of our concrete pavements we can preserve them in good condition.

It is the writer's sincere belief that the primary reason for the failures of



★ The unit used in melting rubber compound for joints. Consists of two boilers, or heaters, with the inner one for rubber and having a capacity of 200 gals. The outer one has a capacity of 500 gals, and AC-30 asphalt is used as a heating medium. Thermometers in each material control the heat which should not be in excess of 450° F for the rubber (thermometer on top)

our concrete pavements is the fact that surface water enters the sub-grade through the joints and cracks. If we can prevent this, it is thought that the problem has been solved. In connection with the mudjacking, we are also installing precompressed boards in the joints and sealing the upper $\frac{1}{4}$ in. of the joint with a rubber compound. Cracks are being sealed

by the use of AC-30 asphalt which is again heated with blow torches after being poured. This increases the penetration of the asphalt into the crack. The flame from the torch should be moved over the asphalt and not allowed to remain in one area, as the asphalt may be burned.

The writer does not feel that he could close this paper without one



★ A pneumatic tamper is used on concrete patches which are screeded by hand



★ An area which has been prepared for portland cement concrete patch. Note form board at longitudinal center joint and also reinforcing steel.

★ At infrequent intervals, in attempting to raise a low end of a section or slab, the other end may start rising. This tendency is overcome by placing a loaded truck on the rising end after which the other end may be raised to the desired grade. The truck used here is a Liberty of 1917 vintage





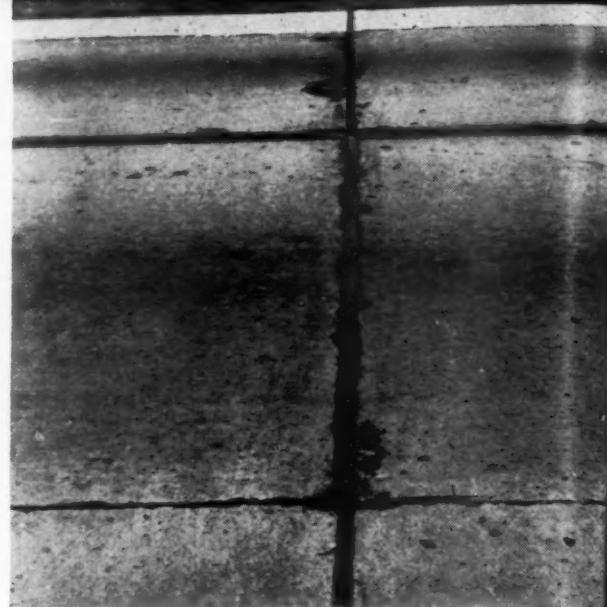
★ Rubber compounds are only used on those joints which have been previously treated, or filled, with pre-compressed boards

★ The joints are poured in half sections and this picture shows a completed half section of a joint. No rubber joints are poured until we have ten days of dry weather, as any latent moisture in the pavement will prevent a good bond of the material; and despite all heating and drying, if the pavement is wet, a good bond will not be obtained

comment on our present concrete pavement design. It is a well-known fact that a vast majority of our soils, whether plastic or not, will support the loads which may pass over them. With the assumption that this is true, a concrete pavement becomes only a wearing surface as does an asphalt surface on a flexible base. One rarely encounters any pumping action on an asphalt pavement and then only due to the breaking down of the pavement and allowing of surface water to enter the base or subgrade. The reason is obvious—the house has a roof on it. The maintenance of joints has not been too expensive for the reason that we have not been maintaining them. The cost of maintaining joints, if properly accomplished, is expensive. The cost of maintaining a "blow-up" at infrequent intervals would be almost infinitesimal as compared to the cost of maintaining joints. In view of this, why do we continue to design concrete pavements with elaborate installations of expansion and dummy joints? Why not eliminate them entirely with the result that we would have much better riding surfaces and the cost of maintenance of concrete pavements would be materially reduced.

13,180 Traffic Deaths

As of June 1, traffic deaths in the United States totalled 13,180. Traffic fatalities for the month of May came to 2,410. The 13,180 death figure represents a 43% increase over those killed in the same period of 1945. This figure, however, is 6.6% less than for the first five months of 1941, the worst year in history for traffic fatalities. Traffic deaths in May were 36% over May, 1945, and 21% under May, 1941—by far the greatest drop shown for any month of 1946 over 1941.



Safety Efforts Bring Reduced Compensation Rates

DOES safety first work pay in the construction industry?

We are indebted to a communication from Roy A. MacGregor, Executive Secretary, Constructors Association of Western Pennsylvania, which throws encouraging light on this question. Reflecting nearly a decade of safety effort among this Association's members, rates in the 1946-47 manual of workmen's compensation rates are today less than one-half of the 1936 rates for the "Roads and Streets" classification. Rates for the year beginning July 1, 1946, are as follows:

Compensation Rates for 1946 (Courtesy of Wallace M. Reid)			
	1936	1945	1946
601 Roads & Streets	\$7.00	\$3.50	\$3.00
603 Sewers	9.75	4.50	3.85
605 Railroads	7.00	4.00	3.40
607 Drilling	6.00	3.00	2.75
609 Excavation	5.50	2.50	2.00
611 Pile driving	9.00	5.15	4.75
615 Tunnels and shafts	12.00	7.50	6.75
653 Masonry	4.45	1.95	1.50
654 Concrete const.	7.50	4.00	3.00
655 Iron erection	15.00	7.50	6.50
713 Dredging	3.85	2.80	2.60

These decreases are in the face of materially increased benefits to the injured, and are naturally an indication that there has been a considerable decrease in the number of men injured on the jobs in production to the payrolls.

"While these figures definitely show a return for the efforts put forth in preventing accidents, they do not tell the whole story," observes Mr. MacGregor. "Today a great many more of our members are receiving substantial credits from these Manual Rates owing to their own individual experience, and others who were re-

ceiving credits in 1936 are now receiving much greater credits.

"We have not gone as far as we should by a long way, for until this Construction Industry reaches the Manual Rate paid around Steel Mills, with their Blast and Open Hearth Furnaces, Bloomir Mills, etc. (which rate is now 95c per \$100 of payroll) we have not caught up with the leaders in Industry in Accident Prevention.

"We, from the Association's standpoint, have always expressed ourselves on the value of accident prevention in dollars and cents to be saved to our members, realizing that when accidents were prevented, men were saved from being killed or hurt and their families saved from the loss of the income of the one injured as well as the worry and anxiety which follow such occurrences.

"However, the employee is not prone to think of these benefits to him as long as we stress the money saving to ourselves in this work.

"In the future it would be well for the employer to approach this matter with the employee on the basis of benefits to be derived by the employee and his family in preventing worry and anxiety to invade the home.

"This fact was presented forcibly at the superintendents' and foremen's meeting on May 15, 1946 by Hunter P. Wharton of the Operating Engineers, and we believe it is a point in which we can improve our work materially in the effort to save men from getting hurt."



★ Two graders worked a section of two thousand feet of base, the length depending on distance of water haul and other factors. Operators here are skimming in conjunction with final rolling and preparation for tack coat.

New Mexico Stabilizes Clay Subgrade with

2% Portland Cement Admixture

Designed solely to reduce Plastic Index and dust ratio, this procedure proved more economical than granular admixture due to long haul

SOUTH of Santa Fe on U. S. 285 this summer the New Mexico state highway department is making its first use of a low cement admixture to change soil characteristics.

The road had an oil mix surface, which failed last winter in spots and showed signs of early failure along a considerable distance, due to the low bearing power of the road following the spring snow melt. This is an arid region, and little trouble is experienced the remainder of the year. Normally, traffic is not heavy, but during the recent Los Alamos and White Sands atomic bomb activity many heavy fuel trucks used the road. All in all, something had to be done to increase its load carrying capacity.

Standard soil tests of the prevailing soil material showed it to be a white adobe clay having a Plastic Index ranging from 10 to 14. Translated, this means weak when wet, and the highway laboratory personnel began investigating ways to reduce the P.I. economically. Tests showed that correction of the soil by mixing

granular material would have required a 50% addition of such material, the alternative being to construct an entirely new base over the existing base. Either procedure would have been costly due to long haul of suitable materials, from the nearest acceptable pit several miles beyond one end of the 19-mile project.

In contrast, a study of various admixtures showed that for this particular soil, addition of a very small percentage of portland cement would definitely reduce the plastic index and increase stability. For example, addition of 1½% of cement reduced the P.I. to a range of 0 to 4 and considerably reduced the dust ratio.

Theory of Action

The theory of this admixture is simple. The unsatisfactory characteristics of the soil when wet are due to the high percentage of colloidal particles. The cement coats or clusters these particles into larger particles.

Naturally the department men felt

that they should go slow on the use of this relatively new idea. A year ago one contractor had found that the addition of a small ratio of cement would correct a similar subgrade from which he would otherwise be forced, under the specifications, to screen out fines to reduce the excessively high dust ratio. He found that cement addition cut this ratio at less cost than the use of larger quantities of granular material.

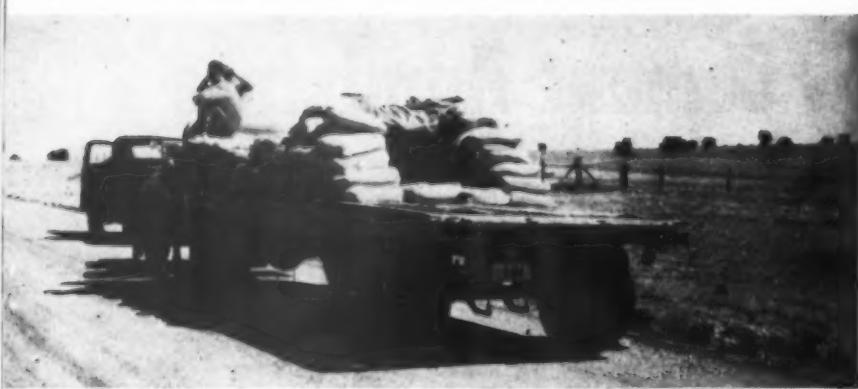
Samples were kept immersed in water for a year, with no disintegration, before it was decided to go ahead. With this backlog of tests, it was decided to make full fledged use of cement admixture on the U.S. 285 job. A ratio of 2% was adopted, solely for the purpose of reducing the plastic index and the dust ratio. No slab strength or structural qualities are provided, soil retaining its flexibility. Hence this procedure is not to be confused with soil-cement. Specifications required that the plastic index of the soil be not higher than 6%.



★ (Above): Water was a problem. Three 2,500-gal. trucks were the bottlenecks of the job, due to the long haul. About 2,500,000 gal. of water was estimated for the project

★ (Left): Like other western contractors, Skousen believes in plenty of pumping capacity and hose size. Six inch here

★ About 32,000 sacks of cement were required for the 19 miles. Cement was trucked in bags and emptied by hand along the windrow



Job Procedure

The procedure for the U.S. 285 job was as follows: The old bituminous topping was scarified and bladed off, and the underlying soil bladed into a windrow. A depth of 6 in. was cement

treated by emptying cement bags along the windrow and working the cement in with blades; then the material was again rewinded and sprinkled in the windrow, spread, and rolled with a sheepsfoot roller followed by a pneumatic roller. The usual pre-

cautions were taken to maintain moisture slightly under optimum, moisture running around 15 or 16% for best results.

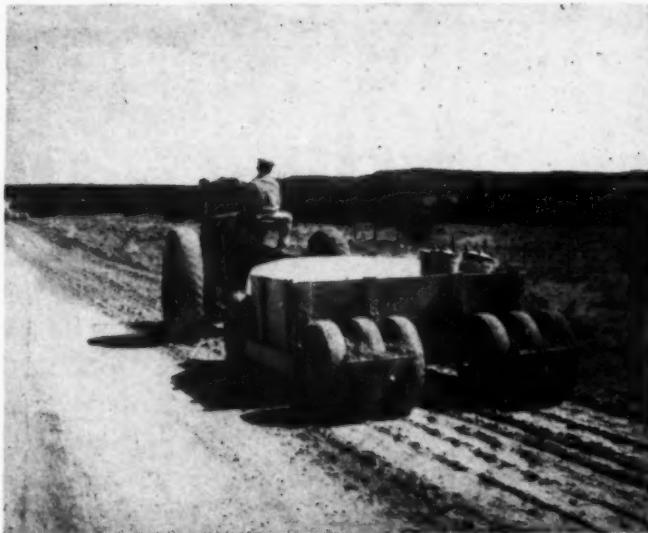
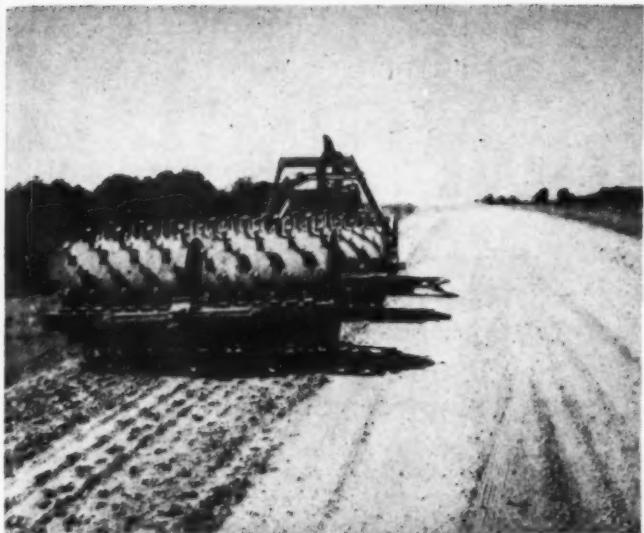
Traffic is let through, and later the road was again sprinkled, bladed and rolled with a flat steel roller. Then

Bids on New Mexico U. S. 285 Project Involving 2% Portland Cement Admixture

18.84 miles of roadway work as described in accompanying article

(1) Skousen Construction Co., Albuquerque; (2) Henry Thygesen & Co., Albuquerque; (3) Armstrong & Armstrong, Roswell, N. Mex.

Items	Quantities	Unit	(1)		(2)		(3)	
			Unit Bid	Amt.	Unit Bid	Amt.	Unit Bid	Amt.
Rolling—Sheepsfoot roller	1,135	Hr.	3.00	3,405.00	6.50	7,377.50	4.50	5,107.50
Rolling—Steel tired roller	435	Hr.	5.00	2,175.00	6.00	2,610.00	5.50	2,392.50
Rolling—Pneumatic tired roller	195	Hr.	5.00	975.00	5.50	1,072.50	7.00	1,365.00
Watering	2,460	M Gal.	3.00	7,380.00	4.00	9,840.00	5.00	12,300.00
Base Course—Cement manipulation	18,836	Mile	170,000	32,021.20	102,400	19,288.06	150,000	28,254.00
Cement	8,005	Bbl.	4.20	33,621.00	5.00	40,025.00	4.50	36,022.50
Heating, hauling and applying cutback asphalt, Type MC-2	2,110	Bbl.	1.70	3,587.00	1.50	3,165.00	1.50	3,165.00
Unloading and hauling AE 250 for plant mix	8,695	Bbl.	1.30	11,303.50	1.20	10,434.00	1.00	8,695.00
Plant mix asphalt surfacing	19,260	Ton	3.35	64,521.00	3.70	71,262.00	4.25	81,855.00
Cover material	2,030	Cu. Yd.	6.50	13,195.00	4.00	8,120.00	5.00	10,150.00
Unloading, hauling and applying AE 250 for seal coat	1,930	Bbl.	1.70	3,281.00	1.50	2,895.00	1.70	3,281.00
10% engineering and contingencies				17,546.47		17,608.90		19,258.75
Totals				193,011.17		193,697.96		211,846.25



★ Sheepfoot followed by pneumatic roller used to get required density. The 95% requirement was exceeded, to as high as 112%, densities being figured by volume using a sand cone

a prime coat was applied, followed by a 2-in. plant mix emulsified asphalt wearing surface, and seal and chips.

The steel roller was preferred in the final subgrade preparation because it helped bring fines to the surface, which made a good胎 for the tack coat.

Skousen Construction Company of Albuquerque was the contractor. This firm's \$193,000 bid details are shown in the accompanying table. Note that the item of cement manipulation was bid at \$1,700 a mile, a rather high figure, doubtless due to the long water haul. Rolling was paid for by the hour, the number of passes being determined by density tests. The 15-mile average haul for topping mix also contributed to the higher than normal cost for such a project.

Art Lucero was the project engineer on the above work, which was built under the direction of B. G. Dwyre, construction engineer, and staff with the close cooperation of the materials department under E. B. Bail. F. G. Healy is state highway engineer.

*

President Signs Legislative Reorganization Act

House and Senate Roads Committees abolished, states ARBA news bulletin

The Legislative Reorganization Act of 1946, signed by the President on August 2, completely revamps congressional procedure and reduces the number of standing committees in the Senate from 34 to 15 and in the House from 48 to 19. This consolidation of committees abolishes both the Senate

and House Roads Committees and sets up a Committee on Public Works in both branches.

Consisting of 13 Senators the Senate Committee on Public Works will have jurisdiction over all proposed legislation relating to the following subjects: (1) Flood control and improvement of rivers and harbors; (2) Public works for the benefit of navigation, and bridges and dams (other than international bridges and dams); (3) Water power; (4) Oil and other pollution of navigable waters; (5) Public buildings and occupied or improved grounds of the United States generally; (6) Measures relating to the purchase of sites and the construction of post offices, custom houses, federal court houses and government buildings within the District of Columbia; (7) Measures relating to the Capitol Building and the Senate and House Office Buildings; (8) Measures relating to the construction or reconstruction, maintenance and care of the buildings and grounds of the Botanic Gardens, the Library of Congress and the Smithsonian Institution; (9) Public reservations and parks within the District of Columbia including Rock Creek Park and the Zoological Park; (10) Measures relating to the construction or maintenance of roads and post roads.

The Committee on Public Works in the House will consist of 27 members and will have jurisdiction over the identical matters specified for the Senate committee with the exception of the item pertaining to roads which reads as follows: "(10) Measures relating to the construction or maintenance of roads and post roads, other than appropriations therefore; but it shall not be in order for any bill pro-

viding general legislation in relation to roads to contain any provision for any specific road, nor for any bill in relation to a specific road to embrace a provision in relation to any other specific road."

Under the new rules as provided in the Legislative Reorganization Act, standing committees of the House and Senate will be elected at the commencement of each Congress. Also, after the election of standing committees the respective branches of Congress will then proceed by ballot to name the Committee Chairmen. Another important change in congressional procedure is the provision in the new law which precludes a member of the House from serving on more than one standing committee, with certain minor exceptions. With regard to the Senate the new rules provide that each Senator shall serve on two standing committees but no more except that Senators of the majority party who are members of the Committee on the District of Columbia or the Committee on Expenditures in the Executive Departments may serve on three standing committees.

Just how these new committees will function cannot be predicted at this time but informed sources indicate that numerous subcommittees will be set up and more than likely there will be a subcommittee on roads in both the Senate and House.

*

Highway Bridges Across Dams

Under a law approved July 24, Federal agencies are authorized to build public highway bridges across dams constructed by them. Determination of the necessity for bridge must be made jointly by the PRA and the state highway department concerned.

New York State's Urban Program

How the engineer is prescribing for traffic illness in congested areas; progress report on a \$487,000,000 5-year job that will mean better opportunity and better living for millions of citizens

By B. D. Tallamy

Deputy Superintendent,
New York State Department of Public
Works

IN varying degrees, the cities of this country have been suffering for years from a pernicious ailment which sooner or later can threaten their economic well-being. Medical men might call it progressive hardening of the arteries. City planners label it a creeping paralysis of congestion. Both are referring to the traffic jams which are today throttling the life out of whole portions of some urban areas. Loss in property values, rentals and tax returns take place as areas thus afflicted languish and become blighted.

The history of the ailment is similar in every community afflicted with these sores of economic dry rot. The first symptoms came years ago when the horse was being replaced by automotive equipment. Until then the streets of our cities were generally capable of carrying the daily traffic flow. The automobile was beyond the



scope of imagination when the street patterns of most cities were created. Business was located in regions which were central and easily reached from all sections. Industry sent down roots in areas close to rail and water transportation facilities. Traffic jams were seldom experienced.

Then automobiles began to crowd the streets and highways. Industry and commerce supplemented rail and water transportation facilities. They adopted the truck as an aid to economic and speedy means of transportation of raw materials and finished goods. Under the stimulus of the motor vehicle which cut the time of travel to one-fifth of what it was, communities experienced unprecedented growth. All too frequently, because it was an unplanned growth, present through-routes dodge and twist and worm their way through a bewildering tangle of streets. In some cities it takes longer to go from city limits to downtown areas than it does to drive 25 or 30 miles on the open highway.

City administrations have been long aware of the growing problem. They called in their own highway "doctors" to prescribe a remedy. But oftentimes the cure proved to be far too costly for the city to undertake. It involved major construction programs of such proportions that local



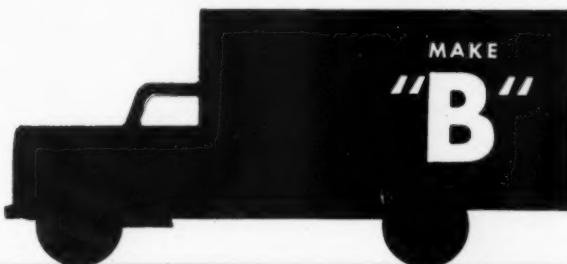
★ Proposed Interchange Erie-Ontario & Niagara Thruways

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1. **FACT:** 14% of all Mack Trucks on the road today were built before 1929...every seventh Mack is over 16 years old.



2. **FACT:** Closest runner-up, make "B" has only 10.3% trucks on the road with 16 years service to their credit.



3. **FACT:** Make "C" has only 7.8% trucks now in use 16 years.



4. **FACT:** Make "D" has only 6.6% of their trucks still operating after 16 years.



(The basic figures are from the latest authoritative national survey of truck registrations, by R. L. Polk & Co.)

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★ Proposed Down-town Interchanges, Buffalo, N. Y.

real estate taxes could not stand the load. Economic considerations resulted in deferment after deferment.

Between 1921 and the outbreak of the war, congestion shifted from chronic to acute stages. It was then that traffic densities zoomed. Within those years heavy trucking in New York State increased by 900% and where there were but 73 cars for each mile of state highway in 1921 there were 211 in 1941.

Then came the war with its absolute curtailment of any construction not directly related to the war effort. Other highway construction stopped dead in its tracks. Congestion spread until now it has become critical in many cities. They are faced with a dilemma to say the least. To defer needed construction to ease the traffic situation would be to invite further loss of local business and industry with consequent reductions in tax and property values. On the other hand needed construction costs, if borne locally, would be so great as to replace untenable tax burdens on the shoulders of the local property owners.

To alleviate this condition the New York State Department of Public Works in 1944 suggested a new "prescription." It called for the construction of urban arterial routes within cities at state expense. Governor Thomas E. Dewey, and the New York State Legislature agreed and wrote the Department's plan into law.

Under this program cities will be required to finance only 50% of the costs involved in right-of-way procurement. The remaining half, plus all construction work, will be undertaken by the state itself. For the first time in the history of the state the Department of Public Works is authorized to develop a system of state arterial routes within cities.

Before any work is done, however, the state, through its Department of Public Works, undertakes considerable additional diagnosis. Through the offices of its ten district engineers it accumulates full data as to existing street patterns, traffic flow, time flow, areas in need of attention, land use and other information of value in developing a system of arteries which will overcome present and expected

traffic congestion, stimulate healthy community growth and redound to the advantage of the state as well. City officials, and others who may have already compiled basic information needed in the Department's study, are invited to make findings available.

Early in the program, full knowledge of traffic conditions is obtained by traffic counts and origin and destination surveys. Through these, the engineer is able to determine on a scientific basis just what the needs of the individual community are now and what they may reasonably be expected to be in the future. Preconceived ideas often prove untenable and must be revised.

Work in this program will not be limited merely to widening or repaving existing streets. Quite often, entirely new arteries must be established. Some of these will be elevated. Others may be depressed. As comprehensive plans are finished, they will be submitted in complete report form to appropriate local officials for study, review and general approval. When endorsed, individual projects will be selected from them in accord-



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Yet half of America lives on roads like this . . . and all of America depends upon them for life and livelihood. Food from farm to city, manufactured goods from city to farm . . . all pass over America's 2,400,000 miles of secondary roads.

Unfortunately, not all of this vital farm-to-market network is as well paved as the road above. More than half is still unsurfaced, and over one-third is still classed as "primitive."

In the work that remains to be done, Barrett Tarvia* road tar will have an increasingly important part. The combination of Tarvia, local materials and local labor enables almost any community to build modern all-weather roads quickly and at low cost.

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ance with their need and available financing.

Typical of the kind of planning which New York is doing to overcome the urban traffic problem is that which has been done for the city of Buffalo where the state has offered for local approval a master plan of state arterial and Thruway routes contemplating a long range and progressive program. It includes two portions of the Thruway system and eleven arterial routes, scientifically designed and located so as to take the bulk of traffic off already congested streets and move it to the downtown area and other centers of mass employment easily and quickly. The plan has projected itself as far ahead as 1960 by providing for the then-probable traffic flow and population densities.

Similarly the State Department of Public Works is scheduled to prepare a like report for each city of upstate New York. Origin and destination surveys planned are for the summer of 1946 in at least 15 major cities of the state. Others will follow in weeks to come until full data are on hand for all cities and urban areas.

New York is fortunate too in its financial position. During the war years, when construction work was impossible, Gov. Dewey and the Legislature combined to lock up, in a post-war reconstruction fund, more than \$500,000,000 of surplus revenue which is now being released for vitally-needed public works construction and reconstruction. The Department has established an \$840,000,000 five-year program in which a total of \$487,000,000 has been earmarked for the rehabilitation of state highways and the construction of urban arterial routes. Another \$202,000,000 will be used for construction of the Thruway which will link together the far corners of the state and tie in with the arterial systems to be constructed for cities along its path. Other funds will be used for grade crossing eliminations, parkways, canals and other public works.

Judicious budgeting in the years ahead, plus anticipable federal aid, if continued on present levels, should enable the Department to progress its program to a successful completion.

For fifteen years New York did very little in the line of highway construction. Now its sleeves are rolled up. It will do in five years what normally would require twenty. New York State has planned and programmed. It now carries out its prescription. The result is evident. It will mean not only better highways but better opportunity; a better living for all!

New England Highway Traffic Authorities Meet in Boston

THE much discussed postwar period is upon us and as expected, traffic accident tolls are soaring while traffic snarls and parking problems are causing wails of distress from the public and officials alike in every part of the country. Now is the time to act, to put into effect traffic engineering safeguards and improvements and to begin construction of the much needed arterials and parking facilities.

This was the theme of discussion at the Third New England Traffic Engineering Conference, held at the Massachusetts Institute of Technology, Cambridge, June 11, 12 and 13, under the sponsorship of the M.I.T. civil engineering department and the traffic engineering section, Massachusetts Department of Public Works. The National Conservation Bureau, accident prevention division of the Association of Casualty and Surety Executives assisted in staging the conference.

The 276 registered delegates participated in the three-day affair, hearing national and local leaders talk on all phases of highway traffic engineering. The third day was devoted exclusively to Boston area problems. The various sessions were held under the chairmanships of E. F. Copell, Traffic Engineer, Massachusetts Department of Public Works; Prof. A. J. Bone of the M.I.T., and Henry K. Evans, traffic engineer, National Conservation Bureau. Brief welcoming addresses were given by Prof. C. B. Breed and Prof. J. B. Wilbur, acting head of the M.I.T. Dept. of Civil Engineering and by Commissioner Joseph F. Cairnes, Massachusetts Department of Public Works. Complete

printed proceedings of the conference will be available soon from the National Conservation Bureau, 60 John Street, New York City.

Proposes Pedestrian Aids

Prof. Theodore Matson, Director, Yale University Highway Traffic Bureau, said during the first session that the greatest reduction in pedestrian accidents must stem from installation of physical aids and controls. He pointed out that nearly everybody is a pedestrian part of the time, while only one-third of our population are drivers part of the time, hence special attention to pedestrian safety is mandatory.

Matson mentioned specifically the general need for improved street lighting, safety islands on wide streets, pedestrian barriers at unsafe crossing points, clear pavement markings, adoption of safe play areas, and shortening and improvement of signal timing to better protect pedestrians and encourage compliance with signal control.

Urge Combination Speed Law

William Greene, Director of the Connecticut highway safety commission, stated his belief that a combination of both *prima facie* and absolute levels makes a sound speed law—say 40 mph. *prima facie* and 50 absolute on undivided highways. Divided routes could accommodate 55 absolute.

He urged that skilled use of publicity accompany any safety program, in order to sell the public on the necessity for regulations and the utility of engineering advances.

(Continued on page 127)



★ Third new England Traffic Engineering Conference Coordinators and Sessions Chairmen: Professor A. J. Bone, M.I.T.; Henry Evans, National Conservation Bureau; and Ed Copell, Massachusetts State Traffic Engineer

National Program for
Secondary Road
Development

(Continued from page 85)

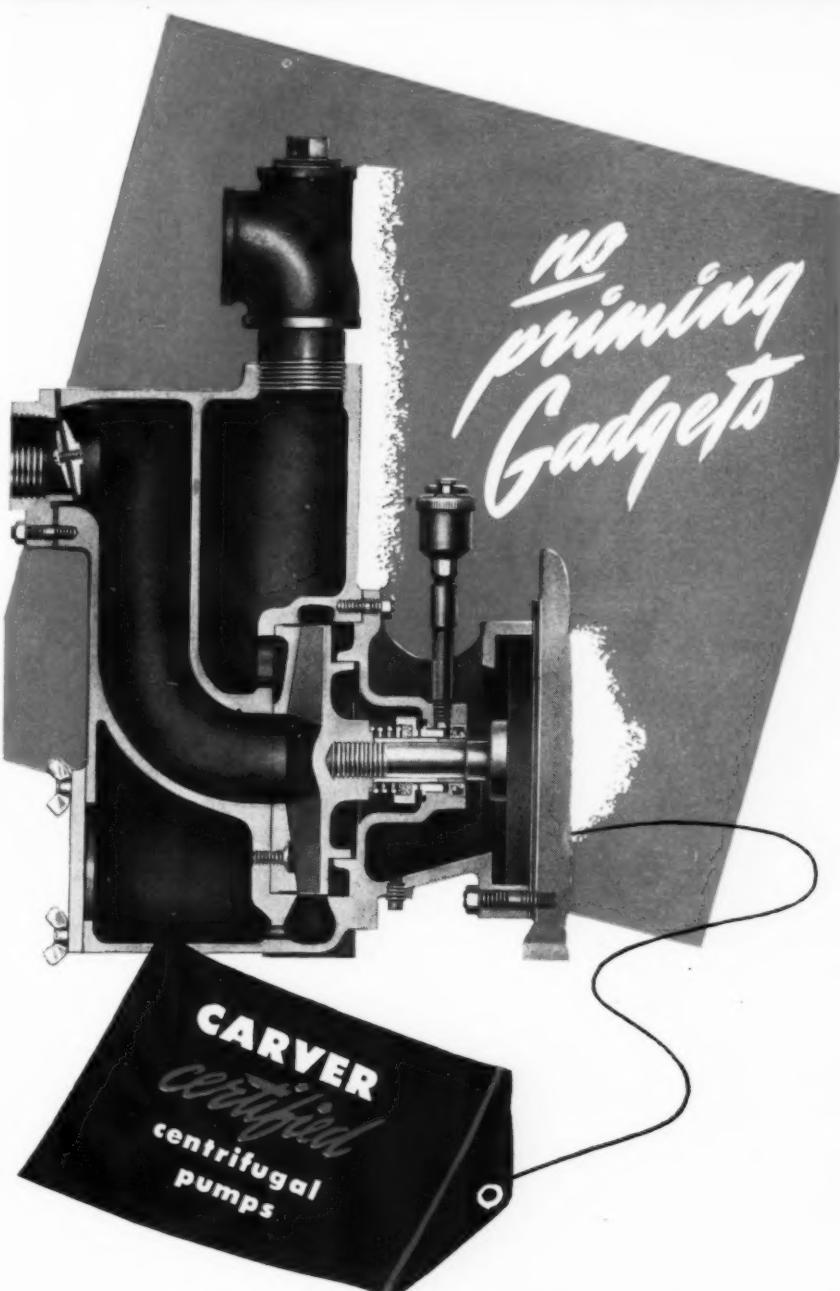
during the depression years the amount fell off rapidly, reaching a minimum of \$236,000,000 in 1934. Recovery since that year has been relatively slight, amounting only to a rise of \$21,000,000 between 1934 and 1941. In 1941 the highway income from property taxes levied by counties and other local rural road agencies was \$257,000,000. This total includes appropriations from the general revenue funds of these agencies, but the source was principally from property.

There has been a constant increase in the state user taxes allocated to local roads, as follows:

For the 5-year period 1927-31, the annual average amount was \$157,000,000; for the 5-year period 1932-36 the average annual amount was \$222,000,000; and for the 5-year period 1937-41 the average annual amount was \$307,000,000. In 1944 there was allocated 25.4% of the total road user revenue to this purpose. In 1941 the excess of road user taxes for local roads above the income from property revenues amounted to approximately \$100,000,000.

While there has been a falling off of the total road user revenues during the war years, it is apparent from their rapid growth since gas rationing was removed, that the total amounts will exceed the prewar years very soon. In addition there is the federal authorization of \$150,000,000 annually for each of the three fiscal years 1946-48. It must be conceded that, when compared with any previous period, the states and the federal government are providing a very substantial contribution to the development of adequate secondary roads. For this discussion it is fair to assign road user tax earnings to the road systems in the ratio of mileage use of the highways. 72.1% of the total rural traffic is carried by the state primary systems. This leaves 27.9% for the balance of the rural roads from which the federal-aid secondary road systems are being selected. There is convincing evidence that the total highway traffic particularly on our primary roads will increase at a rate which, in view of our present inadequate facilities, is alarming. Between 1921 and 1941, registered motor vehicles in operation increased three times, but in the same period the use of the individual vehicle doubled. Thus, in 1941 our highways were called upon to carry not the apparent 3-fold demand of 20 years before, but six times

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the annual mileage of the earlier date.

We all recognize the lag in the war years of replacements of worn-out roads, of deterioration under excessive loads characteristic of war traffic, to say nothing of the need to untangle the traffic congestion of the cities, toward which we have done so little. But the more practical aspect from the angle of those interested in secondary road improvements is that the highways which have the greatest potentials for increased earnings through use must be given the opportunity, since it is in these earnings there lies the greatest hope for additional support funds for secondary roads from the road user source.

Careful studies made during a prior normal period of the effect upon farm values of improved roads led to the conclusion that the provision for reliable year-round service to the farm gate, increased the value of farm property. The raising of road standards above this service except in special cases did not result in materially increasing the value of the land. This fact supports the reasonableness of maintaining an income from property taxes to be used with state and federal allotments to advance the day of acceptable improvements upon the rural road systems.

The officers and members of this Association occupy a unique position since they exercise the prerogatives of both executive and legislative functions in the management of the affairs of the county units. Upon their shoulders rests the responsibility for the levying of taxes, but concurrently their responsibility includes the management of the secondary road improvements. Their recommendations go far in determining state policies and legislation with reference to these roads. The state planning surveys focused upon their individual county problems can be of tremendous service in formulating a sound program. This is one of the surest ways of promoting mutually advantageous co-operation between the state highway departments and the county units. Too often a lack of harmony is produced through failure to understand the problems of each, and this results in conflicting views as to beneficial legislation.

There are serious problems to be met. For example, there is an exceedingly dangerous trend in the failure to collect road user revenues which by every right should come to the public treasury. I refer to the refunds and exemptions of gas taxes. Based on the total consumption of motor fuel within the state, in 1944 sixteen states, including the District of Columbia, refunded or exempted under 5% of the

total consumption of motor fuel for agricultural purposes; ten additional states exempted less than 10%. Thus, 26 states found that fair exemptions for this purpose did not exceed 10% of the total gallonage consumed during the year. Eight states refunded or exempted less than 15% from taxation. Thus, 34 states found that under 15% covered fair exemptions for the purpose—these included many of the dominantly agricultural states. Seven additional states exempted up to 20%. Eight states either refunded or failed to collect taxes on 20 to above 60% of the consumed gallonage. Of these Kansas exempted above 40%, and North Dakota above 60%. None of the states perhaps are more in need of, or more insistent upon, the development of farm roads than these latter two. Perhaps gas rationing had an influence upon the lack of a fine or even a reasonable distinction between the road use and the agricultural use, but this disastrous trend began long before rationing. Is there not an element of fairness to the urban user who has long contributed the major portion of road user income? At least there should be a fair ratio maintained between insistence upon road improvement and the willingness to share the cost. This problem is basic, and should have the best efforts of county, state and federal road officials, first to determine the facts, and second, to support corrective legislation and its enforcement.

Construction Administration

There is no wish on my part to omit discussion of any essential part of the actual securing of the end product, the maturing as rapidly as possible of the improvement of the secondary road systems. The methods adopted for the actual construction are to be determined by agreement between the county officials and the state highway departments. There are no hard and fast federal regulations that will preclude this. If they are so interpreted, this interpretation will be corrected. We believe in the contract method of doing work. It has beyond question proved the most economical. But we are quite willing to submit this to the fire test. There is only one condition—that the test be based on the precise number of units of work accomplished. We do not insist that these units be the conventional ones, either. Some new methods will have to be tried that will introduce the contracting for the improvement of a whole route rather than the short mileage of just a little more than 4 miles which is the average of our current project program. We are ready

(Continued on page 124)



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Skid mountings are available for all sizes of Le Roi AIRMASTERS.

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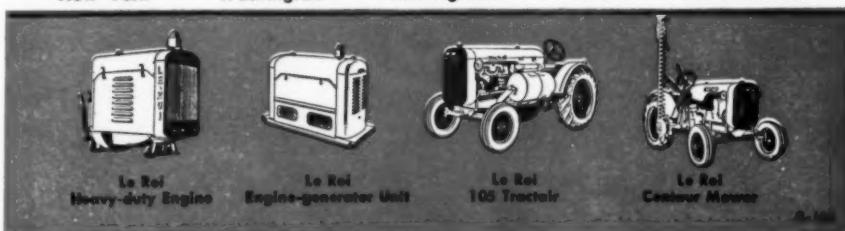
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Worthington-Ransome Blue Brute Distributors

See ad on page 102 for list of equipment in each line

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Holyoke, Massachusetts

Base Design For Bituminous Roads

Recommend base and sub-base thicknesses beneath one-inch of bituminous surface treatment for various wheel loads in North Carolina

By L. D. Hicks

Asst. Engineer of Materials and Tests,
North Carolina State Highway Department,
Raleigh

THE attached tables, 3 to 9 inclusive, list the recommended thicknesses of bases and sub-bases which are surfaced with our regular bituminous surface treatment, having a mat thickness of approximately one inch. The recommended thicknesses are given for subgrade bearing values of 30, 20, 15 and 10 psi., serving under maximum axle loads of 8,000, 10,000, 12,000, 14,000, 16,000, 18,000 and 20,000 lb.

In using the tables, first, select the most probable maximum axle load of appreciable occurrence expected to use the road, and then determine the bearing value of the subgrade, either by test or judgment. The base and sub-base, or base without sub-base, thickness corresponding to these selected factors, may be found in the proper table in the proper column.

Selection of Loads

Load selection should be done carefully and with some judgment. Observations made of the type and size of trucks using the road, or likely to use the road, plus some forethought, should enable the designing engineer to select the proper load. Trucks may be grouped into four types, light single-unit trucks with a manufacturer's rated capacity of 1½ tons or less, medium single-unit trucks with a manufacturer's rated capacity of over 1½ tons but less than 5 tons, heavy single-unit trucks with a manufacturer's rated capacity of over 5 tons, and trailer-truck combinations which have no definite rated capacity, but in general the combinations are designed to carry loads heavier than single-unit trucks. Truck-weight surveys conducted in this state indicate that 95% of the axle loads are less than 9,000 lb. on light single-unit trucks, less than 13,000 lb. on medium single-unit trucks, and less than

EDITOR'S NOTE: Mr. Hicks, who is also Chairman of the Compaction Committee of the Highway Research Board, in discussing the method used in North Carolina for determining recommended base and sub-base thicknesses, pointed out that the method described is of a tentative nature and subject to modification as research work indicates any need therefor. While Mr. Hicks expects no drastic changes in this method, state engineers are constantly searching for pertinent information both as to the durability of existing bases and the bearing power of various subgrade soils which may affect it in one way or another.

The base thickness tables were computed in accordance with the method developed by Roland Vokac, Berry Asphalt Co. of Chicago, Ill. Mr. Vokac's method is discussed in the Proceedings of The Association of Asphalt Paving Technologists, Vol. 15, Page 71, in a paper entitled, "A Prac-

tical Way to Design the Thickness of Surface and Base Courses for Flexible Pavements." The method is described in a more condensed manner in the 1943 Proceedings of the Highway Research Board, page 155, in a paper entitled "Thickness of Surface and Base Courses for Flexible Pavements."

Mr. Hicks explained that the Vokac method was selected as it has been found to be entirely adaptable and to check closely with determinations made by other methods. Considerable investigation has shown the behavior of various bases, the thickness of which was determined by this method, to be uniformly satisfactory in design. At present materials and testing engineers are engaged in research and testing activities which quite likely will result in an adaptation of the Vokac method for determining the thickness of sand asphalt pavements for North Carolina highways.

18,000 lb. on truck-trailer combinations. The heavy single-unit type of truck does not seem to be used in numbers sufficient to warrant using the data obtained from the surveys. It will be noted that the axle loads of the different types of trucks indicate that the trucks are very much overloaded, but such is not necessarily the case, as it seems that the manufacturer's rated capacity is not the operating capacity of the truck.

The size and number of tires used on trucks also indicate the axle or wheel loads. Table No. 1 gives the most common tire sizes, their rated capacity, and the average loads carried by them according to data obtained from a recent truck-weight survey. The last column in the table, "Axe Load Group," is the axle load likely to be encountered with trucks equipped with the corresponding size of tire.

Subgrade Bearing Values

The bearing value of the subgrade is probably the most difficult value the designing engineer has to determine. A value may be obtained from load-test data, but must be corrected for adverse field conditions by data obtained from supplementary tests, which makes the final determination a rather long and laborious task. This procedure, however, is the best and most accurate. Some such tests have been performed by the Soils Laboratory, and more are in progress, in order to more accurately rate subgrades according to bearing values; however, a sufficient amount of this work has not been done to permit the use of the data, except as a guide. Until sufficient data are available, the following values in Table No. 2 are given to subgrades encountered in this State. The values are based on some tests, such as load-tests, and shear tests conducted on various soils containing high percentages of moisture which may be expected during wet seasons; some data taken from the publications of organizations who have made such tests; and, observations of the performance of the various soils in this State as subgrades. These values are rather general, but are believed to be sufficiently accurate for use, although probably on the conservative side, until more work along this line permits their revaluation.

Type of Base

It will be noted from the tables No. 3 through 9 that a base structure may consist of a certain number of inches of traffic bound macadam (TBM) over a sub-base of a certain thickness, except when the subgrade

Recommended Base and Sub-base Thicknesses Beneath 1 In. of Bituminous Surface Treatment for Various Wheel Loads

Table No. 1—Tire Loads

Tire Size	Ply	*Rated Capacity	*Ave. Measured Load	*Ave. of the Over-Loads	**Axe Load Group
11.00 x 20	12	4,500	3,773	4,950	20,000
11.00 x 22	12	4,750	3,830	...	20,000
11.00 x 24	12	5,000	4,100	6,400	20,000
10.00 x 20	12	4,000	3,539	4,473	18,000
10.00 x 22	12	4,275	3,772	5,158	20,000
10.00 x 24	12	4,550	3,517	...	20,000
36 x 8					
9.00 x 20	12	3,850	2,967	4,050	16,000
9.00 x 20	10	3,450	3,133	3,989	16,000
8.25 x 20	10	2,750	2,792	3,311	14,000
34 x 7					
7.50 x 20	10	2,700	2,338	3,200	14,000
7.50 x 20	8	2,250	2,369	2,722	12,000
32 x 6					
7.00 x 20	10	2,250	2,324	2,738	12,000
7.00 x 20	8	1,950	2,163	2,500	10,000
32 x 6					
6.50 x 20	8	1,950	2,275	2,383	10,000
6.50 x 20	6	1,700	...	...	8,000
6.00 x 20	8	1,700	...	...	8,000

Note: *—For single tires.

**—For dual tires. Use one-half value for single tires.

Table No. 2—Tentative Subgrade Bearing Values

Subgrade Bearing Value	Description of Soil
30 p.s.i.	Sandy soils, containing not more than 35% material passing a No. 200 sieve. Good drainage. Subgrade should be below the frost line.* Good subgrade.
20 p.s.i.	Clay soils, but not heavy clay soils (50% or more clay). Good drainage. The subgrade must be below the frost line.* Fair subgrade.
15 p.s.i.	Heavy clay soils or clay soils where drainage is uncertain. Subgrade should be below frost line.* Poor subgrade.
10 p.s.i.	Heavy clay soils with poor drainage. Very poor subgrade.

*Frost line is the depth below which water in the underlying soil will not freeze.

Table No. 3

Type of Load: Trailer-truck combinations, heavily loaded. Axle loads not exceeding 20,000 lb.	Air Pressure + 10% = 100 p.s.i.
Wheel Load: 10,000 lb.	Equivalent Diameter = 11.3 in.
Contact Area: 100 sq. in.	30 p.s.i. 20 p.s.i. 15 p.s.i. 10 p.s.i.
Subgrade Bearing	8 8 8 8
TBM Base, In.	0 3 5 8
Sub-Base, In.	
Total Base Thickness Without Sub-Base	
TBM, In.	8 10 12 16

Table No. 4

Type of Load: Trailer-truck combinations, loaded to capacity. Axle loads not exceeding 18,000 lb.	Air Pressure + 10% = 96 p.s.i.
Wheel Load = 9,000 lb.	Equivalent Diameter = 10.9 in.
Contact Area = 94 sq. in.	30 p.s.i. 20 p.s.i. 15 p.s.i. 10 p.s.i.
Subgrade Bearing	7 7 7 7
TBM Base, In.	0 3 4 1/2 8
Sub-Base, In.	
Total Base Thickness Without Sub-Base	
TBM, In.	7 9 1/2 11 1/2 15

bearing has a value of 30 psi. It will also be noted that for a certain load the *base thickness* remains the same while the sub-base changes with the value of the bearing of the subgrade. The reason for this is that the required thickness of sub-base in each instance raises the bearing value of the subgrade to 30 psi. This type of base structure (combination of base and sub-base) is considered the strongest and most economical in that

the strongest and most costly material, TBM, is used in the top when it is needed. TBM materials consist of materials meeting the material requirements as given in Section 53 of the 1942 Specifications or the requirements for *Soil Type Base Course* (STBC), "Case II," Section 52. These materials are capable of producing a base having a bearing value approaching 100 psi, if the base is constructed to the proper thickness, de-

Table No. 5

Type of Load: Trailer-truck combinations, medium loaded. Axle loads not exceeding 16,000 lb.	Wheel Load = 8,000 lb.	Air Pressure + 10% = 93 p.s.i.	
Contact Area = 87 sq. in.		Equivalent Diameter = 10.5 in.	
Subgrade Bearing	30 p.s.i.	20 p.s.i.	15 p.s.i.
TBM Base, In.	6 1/2	6 1/2	6 1/2
Sub-Base, In.	0	3	4 1/2
Total Base Thickness Without Sub-Base			7 1/2
TBM, In.	6 1/2	9	11
			14

Table No. 6

Type of Load: Medium single-unit trucks, heavily loaded. Axle loads not exceeding 14,000 lb.	Wheel Load = 7,000 lb.	Air Pressure + 10% = 89 p.s.i.	
Contact Area = 79 sq. in.		Equivalent Diameter = 10.0 in.	
Subgrade Bearing	30 p.s.i.	20 p.s.i.	15 p.s.i.
TBM Base, In.	6	6	6
Sub-Base, In.	0	3	4
Total Base Thickness Without Sub-Base			7
TBM or STMC, In.	6	8 1/2	10
			13

Table No. 7

Type of Load: Medium single-unit trucks, medium loaded. Axle loads not exceeding 12,000 lb.	Wheel Load = 6,000 lb.	Air Pressure + 10% = 83 p.s.i.	
Contact Area = 72 sq. in.		Equivalent Diameter = 9.6 in.	
Subgrade Bearing	30 p.s.i.	20 p.s.i.	15 p.s.i.
TBM Base, In.	5 1/2	5 1/2	5 1/2
Sub-Base, In.	0	3	4
Total Base Thickness Without Sub-Base			6 1/2
TBM or STBC, in.	5 1/2	7 1/2	9 1/2
			12

Table No. 8

Type of Load: Light single-unit trucks, heavily loaded. Axle loads not exceeding 10,000 lb.	Wheel Load = 5,000 lb.	Air Pressure + 10% = 81 p.s.i.	
Contact Area = 62 sq. in.		Equivalent Diameter = 8.9 in.	
Subgrade Bearing	30 p.s.i.	20 p.s.i.	15 p.s.i.
TBM Base, In.	5	5	5
Sub-Base, In.	0	3	3 1/2
Total Base Thickness Without Sub-Base			6
TBM or STBC, in.	5	7	8 1/2
			11

Table No. 9

Type of Load: Light single-unit trucks, medium loaded. Axle loads not exceeding 8,000 lb.	Wheel Load = 4,000 lb.	Air Pressure + 10% = 81 p.s.i.	
Contact Area = 49 sq. in.		Equivalent Diameter = 7.9 in.	
Subgrade Bearing	30 p.s.i.	20 p.s.i.	15 p.s.i.
TBM Base, In.	4	4	4
Sub-Base, In.	0	3	3 1/2
Total Base Thickness Without Sub-Base			5 1/2
TBM or STBC, in.	4	6	7 1/2
			9 1/2

pending upon the bearing value of the sub-base or subgrade.

A "Total Base Thickness Without Sub-base" is also given in tables No. 3 through 9. This thickness is used when only one type of base material is available. For axle loads in excess of 14,000 lb. the material should be TBM or STBC, Case II. For axle loads of 14,000 lb. or less, TBM or STBC, Case II materials are to be preferred, but STBC materials, Case I, have been used successfully. Case I, STBC materials contain less than 40% of plus No. 10 sieve material, while Case II materials contain more. Case I materials occur as natural topsoils and sand-clays and are sometimes produced by mixing two or more materials. Case II materials also occur naturally, sometimes, but in most instances are produced by mixing soils and coarse aggregate.

Sub-base Design

A sub-base is used, primarily, to increase the bearing value of the natural subgrade, although it is in many instances used for other purposes, such as a blanket course to prevent infiltration of soft clay into the interstices of crushed stone or gravel bases, or to lower certain types of subgrades below the frost-line. Sandy materials are required for sub-bases and should not contain more than 35% of minus No. 200 sieve material.

Materials meeting the requirements of Soil Type Base Courses, Section 52 of the 1942 Specifications, are, of course, satisfactory for sub-base construction. Also, those meeting the requirements of Subgrade Reinforcement, Section 33 of the 1942 Specifications, are satisfactory. Materials containing aggregate not to exceed 2

in. in size are satisfactory for sub-bases, provided they contain at least 40% of fines (material passing a No. 4 sieve). This requirement is necessary in order to prevent the infiltration of clay from the subgrade, if and when the subgrade becomes soft. Of the material passing the No. 10 sieve, not more than 35% should pass the No. 200 sieve.

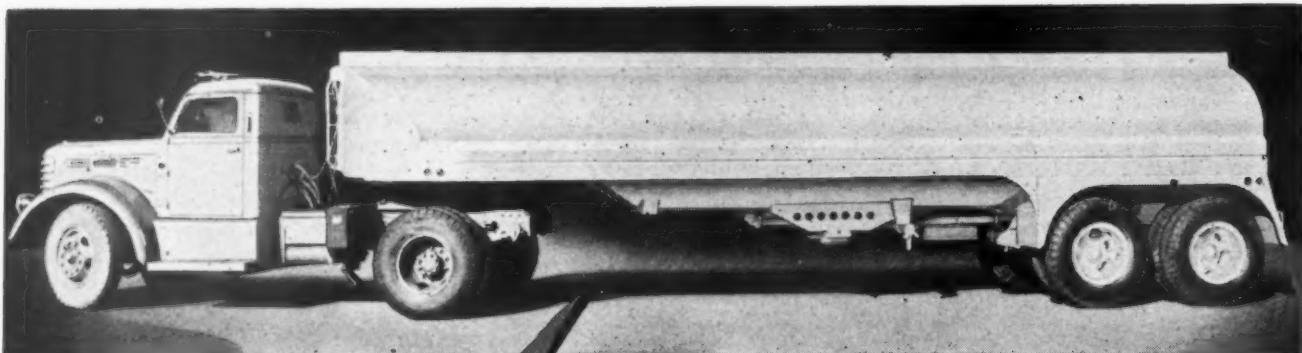
Congress Approves Airport Funds

House Action Presages Large Airports May Participate in 1947 Federal-Aid Appropriation.

Congress has passed the State, Justice, Commerce Appropriation Bill; included therein is an appropriation of \$45,000,000 for airport development during the 1947-fiscal year, according to word from ARBA. Of this amount, \$43,260,000 will be for construction in the United States, and \$1,740,000 for construction in Hawaii, Puerto Rico and Alaska. As previously reported, sponsors of airport development projects will be required to match these construction funds. Of the total appropriation, not more than \$2,250,000 may be used for administrative purposes. An appropriation of \$2,975,000 was included for advance planning. Early Presidential approval of this legislation is expected.

Inasmuch as the Federal Airport Act authorizes appropriations up to \$100,000,000 in any fiscal year, it is possible an additional appropriation for airport construction (in a Deficiency Appropriation Act) may be made before the close of the fiscal year, June 30, 1947. This will depend on airport development-progress.

The House branch of Congress has passed H. R. 6741, introduced by Congressman Bulwinkle (D., N.C.), and an appropriate committee in the Senate has reported it to the Senate, where early and favorable action is expected. As previously reported, its provisions would do away with the requirement in the Federal Airport Act —only so far as the 1947-fiscal year is concerned—requiring the Administrator of Civil Aeronautics Administration to submit to Congress a request for authority to undertake during the next fiscal year the development of Class IV and larger airports, doing so at least two months prior to the close of the fiscal year, June 30, 1946. This would permit allocation of Federal-aid funds being made for Class IV and larger airports during the present fiscal year.



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T-115

Rise in Costs Explained by Carolina Contractors

Part of a statement prepared for release by the Carolinas Branch of the Associated General Contractors of America, Inc.

THE question of higher construction costs of highways is paramount in the minds of all contractors and state highway officials today. A committee was appointed by the Carolinas Branch Associated General Contractors of America, Inc., to discuss costs and the trends influencing them. Findings were presented to the highway commissions of North Carolina and South Carolina.

(The committee was composed of N. K. Dickerson, Sr., Chairman, Monroe; N. K. Dickerson, Jr., Monroe; Karl Sloan, Fayetteville; E. D. Sloan, Greenville, S. C.; J. Gregory Poole, Raleigh; William F. Bowe, Augusta, Ga.; C. P. Ballenger, Jr., Greenville, S. C.; and Herman Wolfe, (Raleigh.)

Costs Increase

It is a recognized fact that costs of doing business of all types have increased over pre-war times, but the problem that confronts the highway departments at this time is just how much actual increases in costs are represented in bids being submitted, how much is being carried in contingencies and how much represents excess profit which may have been loaded into the job.

On competitive bidding the law of averages and the law of supply and demand have always kept prices at or below a reasonable profit except in extreme cases. Occasionally work of an undesirable nature is let and at a time when the market is loaded. Due to this fact some bids may be unreasonable or perhaps no bid at all will be received. However, these cases in dollar value represent only a small percentage.

No contractor with an organization is inclined to pass up work or submit bids on work if he thinks he has a chance to get the work with a reasonable expectation of profit and yet we find contractors without work who are not bidding because they think they can not get work awarded at the price at which they are willing to bid.

1940 Prices
It seems that the various highway departments have adopted 1940 prices as a base and proceeded from there with certain set percentage allowances arbitrarily assumed that this figure or that figure would be in line.

In this statement we will endeavor to set out the fixed increase in the costs of operations, and the additional hazards which have to be considered. A comparison with a weighted average of prices bid before the war as a means of determining the suitability of the bid submitted is very dangerous.

Assuming that pre-war bids on common excavation ran from 16 to 65 cents per cubic yard, this would mean an average of 40.5 cents. In this range of pre-war prices the 16 cent price would represent short balances and easy moving dirt, the 65 cent price would represent either wet dirt, a small quantity, or sticky gumbo type of soil.

Assuming the 35% increase, reportedly recommended by the Public Roads Administration, this would give an average price of approximately 55 cents per cubic yard. Now, if no bid would be considered above 55 cents, what would happen to the jobs for wet excavation or sticky gumbo types of soil or small jobs which were bringing 65 cents before the war—they would of course have to be rejected.

On the other hand a contractor's bid, providing it ran 54 cents could be considered, although it might be the type of soil that had been bid at 16 cents before the war and only worth, according to the percentage used above, 21.6 cents at the present time. It is very dangerous to use a weighted average plus a percentage to determine the acceptability of present day bids.

Things To Be Considered

The things to be considered in the increased cost of construction today are as follows:

First, the efficiency of labor. The higher rates of pay during the war work, coupled with the lack of aggressiveness of foremen and superintendents who coddle their subordinates due to scarcity of labor has had a psychological effect on labor in general. To an alarming extent they are all looking for a soft job at big pay. They are unwilling to accept work on a lower scale than they were doing during the war.

... It is commonly known that we are using cheap dollars—everyone in business knows that—but there is a marked increase in the cost of equipment. For one example, a pick-up truck with spare tire could be purchased in 1941 for \$560. Today a pick-up truck, without a spare tire, will cost almost \$1,100. . . . All of these increased costs of owning equipment must be put into the price asked for in the work.

... It is noted that labor, insurance and supplies have increased 85%; hauling 78%; moving, 20%; depreciation and profit, 10%. Another item in the cost of doing the work that is in one sense of the word a hidden cost is the statistical work required by public bodies. . . .

It is our belief that the increased costs of performing highway work will vary from 30 to 100%, depending on the exact nature of the work and type of equipment available for the work.

... Summing up, we believe that the biggest increase in cost of doing work today is: First, the inefficiency of the present day skilled and unskilled labor, or in many cases their inability to be efficient. Second, the increased cost of wages per hour and the many limitations requiring overtime pay. Third, the use of old equipment necessitating shut-downs during which period payrolls continue, and the increased cost of maintenance and upkeep.

Fourth, the increased cost of performing the additional statistical work added on the contractor's shoulders. Fifth, the necessity of carrying men during breakdowns or shutdowns. Sixth, the increased cost of transportation which has at least doubled. Seventh, the increased cost of equipment where new equipment can be purchased. Eighth, the fact that the same percentage of profit today only brings the owner about 40% as much purchasing power as it used to bring. . . .

The Pennsylvania highway department bought 246 new trucks and 532 new snow plows this year up to August 25.

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CONTRACTORS

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transmission and rear axle ratio to move the weights you carry. It has the *right* axles, springs, frame, and tires to carry *your loads* more dependably . . . and at rock-bottom cost.

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DODGE DIVISION OF CHRYSLER CORPORATION



DODGE *Job Rated* **TRUCKS**

FIT THE JOB . . . LAST LONGER

ONLY DODGE BUILDS "Job-Rated" TRUCKS!

Leather Belting

How to Make It Last Longer

Helpful tips on correct installation, care and maintenance brought to you through the American Leather Belting Association

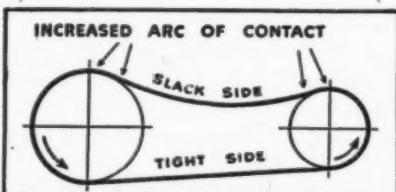
How to Install Leather Belts Correctly

TIME spent in checking alignment, tension and other recommended details in the installation of a belt is not wasted, as the cost is repaid in better belt performance.

For best results a leather belt should be run with the least tension needed to transmit the load without slipping.

If a belt is run too slack it will slip, causing its surface to glaze, then crack and peel.

If it is too tight, it may place excessive loads on bearings.



Wherever possible flat leather belts should be run with slack side on top. (Fig. 1) This will provide a greater arc of contact between belt and faces of the pulleys. On short-center or vertical drives use a pivoted motor base.

Use care in forcing an endless belt over the pulleys so as not to put a crook in it. Belts, particularly those 6 in. or wider, should either be made endless on the job by means of clamps and rods or slipped on after temporarily shortening the center distances between pulleys by means of motor

slide rails or loosening hanger bolts, etc.

If quarter-turn drives are put on with clamps and rods, better machine production, fewer shutdowns and longer belt life will result.

To get greatest pulling power from leather belts the grain or hair side of the belt should run next to the pulley faces.

On flanged or step-cone pulleys, it is good practice to use belts that are at least $\frac{1}{8}$ to $\frac{1}{4}$ in. narrower than the pulley faces.

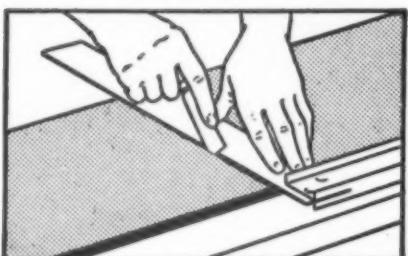


Figure 4

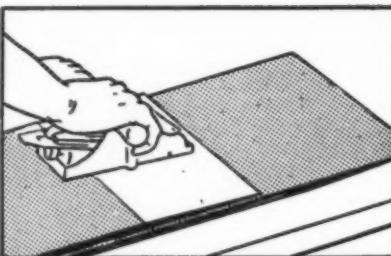


Figure 10

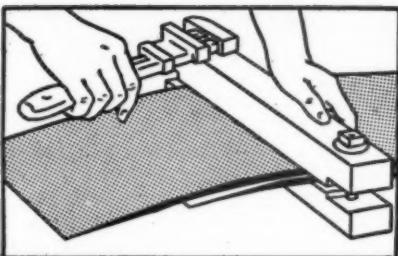


Figure 11

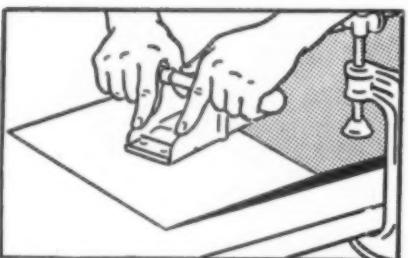


Figure 5

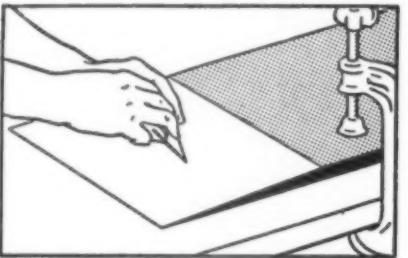


Figure 6

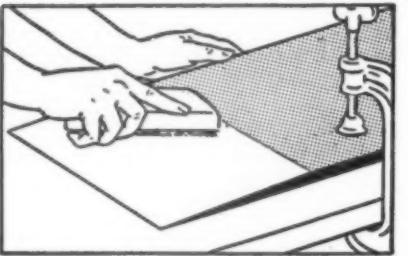


Figure 7

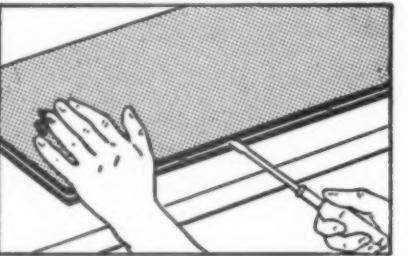


Figure 8

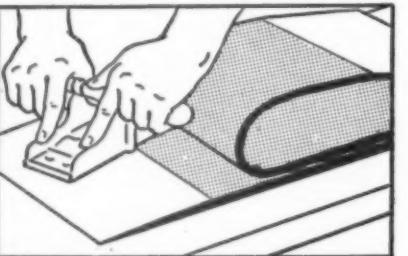


Figure 9

Width of Belt	Lap Length per Ply	Break Length
Under 8"	4"	8"
8" to 12"	4"	10"
12" to 18"	4"	16"
18" and over	4"	20"

3. Prepare belt lap. If single-ply belt:

- Draw a line across the heels of the laps, the laps being so planned that they will point in the same direction as the other laps in the belt.
- Shave down belt ends tapering evenly from heels to tips (Fig. 5).
- Remove high spots with belt scraper and finish to feather edge so that the completed lap will be same thickness as body of the belt (Fig. 6).
- Roughen belt fibres with scratcher. (Card clothing approximately No. 26 or 28) (Fig. 7).
- Brush off loose fibres.

If Double-Ply Belt:

- Separate plies on female end of belt for a distance three inches longer than overall lap length (Fig. 8).

(g) Cut back the bottom ply an amount equal to the break. (For ease in splicing, the long leg of the female end should always be made on the top ply of the endless or field lap.)

(h) Shave female end as shown in sketch (Fig. 9).

(i) Shave outer surface of male end so that it matches in length with female end (Fig. 10).

(j) Continue preparation of lap as for single-ply belt (See section 3—c, d, and e).

4. Place prepared belt around pulleys so as to run in the proper direction.

5. Mark belt, using square, at points immediately beyond where clamps will be applied, this mark to serve as a guide in keeping clamps at right angles to the belt edge, and as a check against any slippage of clamps.

6. Place belt clamps as far back as possible to allow ample take-up on rods (Fig. 11).

7. Tighten rods making one turn at a time on each rod so that length on both edges of belt will be kept equal. Where possible rock or turn pulleys to work out all belt slack.

8. Fasten working platform (Fig. 12).

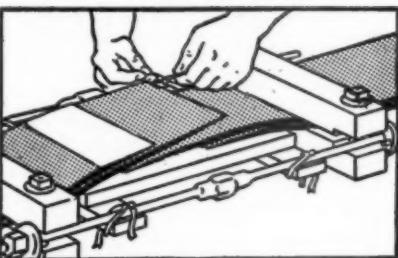


Figure 12

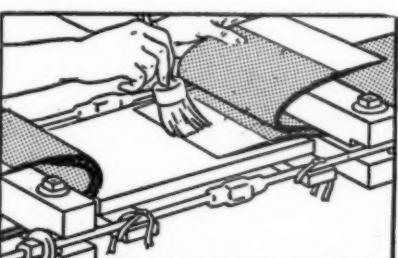


Figure 13

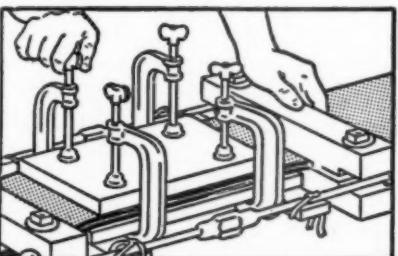


Figure 14

9. If belt is drawn up further than anticipated, cut back male end to make laps match.

10. Apply waterproof cement sizing coat (Fig. 13).

11. Let dry 30 minutes or until clear. If the first sizing coat does not dry with a shine, a second coat should be applied and left to dry (Fig. 13).

12. Apply the final or sticking coat of cement. Quickly place cemented ends together, matching carefully, and press between boards with C clamps. A few tacks hammered in splice will help to keep ends from shifting (Fig. 14).

13. Let dry for half an hour or more before removing C clamps and boards.

14. After allowing splice to dry thoroughly, for at least five hours, remove belt clamps and rods as well

as any tacks that might have been used.

Leather Belt Maintenance

Inasmuch as belts are the connecting link between power and production it pays to have a competent individual in definite charge of their installation and maintenance.

In any case it will pay to establish a system of inspection at regular intervals to check the following:

1. Is belt too dry?
2. Is it dirty or saturated with oil?
3. Is it too slack or too tight?
4. Are the pulleys and shafting in alignment?

5. What is the condition of laps, plies, lacing and ends of laced belts?

If belt guard, shifters, guides or pulley flanges rub against edge of belt, laps and plies may open up. This condition should be corrected immediately. A good belt shifter has broad and well-rounded surfaces so as to spread thrust over a large belt edge area.

Another cause of ply and lap separation, as previously pointed out, is running too heavy a belt on a small pulley.

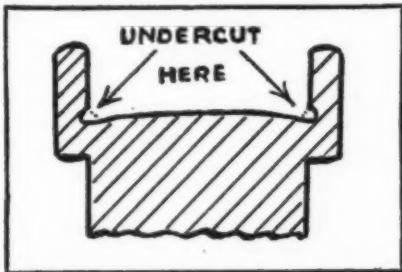


Figure 15

On flanged or step-cone pulleys, belts frequently have a tendency to climb. Fig. 15 shows a simple method of correcting this condition, by machining or undercutting the fillet.

If blisters occur on belt and an immediate stoppage for repairs is impossible, puncture the blister with a knife or awl on the trailing end. Travel of the belt over the pulley will then flatten out the blister and it can be cemented when time is available.

How to Shorten a Leather Belt

When a belt becomes loose, it will slip excessively, causing loss of power and undue wear on the belt. A loose belt should be shortened immediately, following the approved procedure outlined below:

1. Apply belt clamps at field splice and tighten rods to relieve tension on it. The belt is then ready to be opened (Fig. 16).

2. Fasten working platform (Fig. 17).

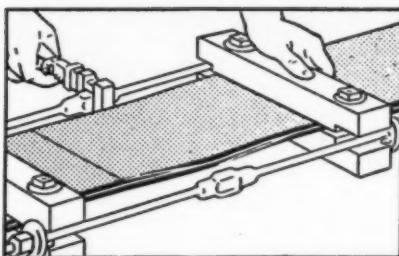


Figure 16

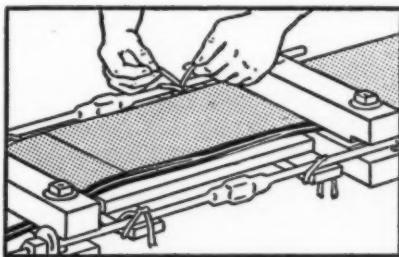


Figure 17

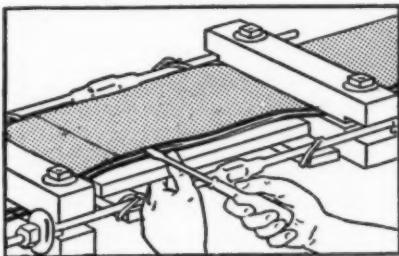


Figure 18

3. Insert a large screwdriver or lap opener one to two inches back of the points of lap and work toward feathered edge (Fig. 18).

4. After completely opening field splice, pull up belt desired amount by tightening the rods evenly.

5. Scrape off all the old cement on the female end.

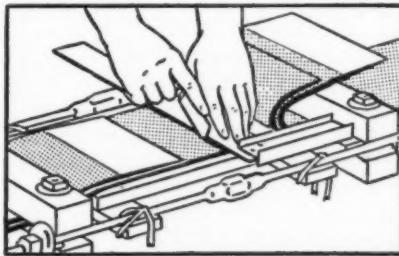


Figure 19

6. Shorten male end and prepare to fit (Fig. 19).

7. Prepare lap (Figures 3 to 10). (On double belts make the new lap on the male end.)

8. Cement (Figures 11 to 14).

Cleaning and Dressing Leather Belts

Keep belts as clean as possible at all times for best results. If machine bearings are throwing oil or grease, these substances will get on the belt, reducing its life and pulling power.

If leak cannot be stopped at the

source, the installation of deflectors or throwing discs will be helpful.

A small amount of oil on a belt can sometimes be removed by ordinary wiping. If this does not do the job, give it a thorough scrubbing with a solution of carbon tetrachloride and unleaded gasoline, using a stiff jute brush and working in the direction of lap joints so as not to lift them but rather lay them down, or

Remove belt and soak it for five or six hours in a degreasing solution consisting of one part carbon tetrachloride to three parts of unleaded gasoline. If carbon tetrachloride is not available, the belt can be soaked in any of the cleaning fluids used by dry cleaning establishments. Due to the fire hazard, the soaking of the belt should be done in the open or where ventilation is good. After removing from the bath, allow belt to dry thoroughly.

Leather belting should always be redressed after cleaning.

Use a belt dressing approved by the belt manufacturer and designed to supply the necessary currier's oil which was lost in use or during cleaning.

When pulley faces begin to polish it is a sign that dressing is needed on the belt. Under normal conditions dress belts every three to six months.

If cemented laps show signs of opening, stick them down immediately.

How to Align Shafting and Pulleys

Belting cannot give good service if the pulleys or shafting are out of alignment. Indications of misalignment are: belt running off the pulley at one side or rubbing or climbing on flanged or step-cone pulleys.

A simple test to determine whether the fault is the alignment or a crooked belt, is to turn the belt inside out or end for end. If it still runs to the same side of the pulley as before the fault is in the alignment—not the belt.

It is important to check drive alignment at least once a year. In multiple story buildings, shifting of loads on floor above shafting may cause it to be distorted or thrown out of alignment.

Some common faults in drive alignment are:

1. Shafting carrying driving and driven pulleys may not be parallel.

2. Shafting may be sprung out of line. (Hangers should always be located near the pulleys, the points of maximum load.)

3. Driving and driven pulleys may be offset.

4. Pulley may be eccentric with shafting.

An easy method of aligning pulleys and shafting is shown in the following diagram.

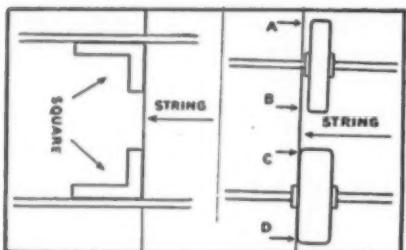


Figure 20

Procedure:

1. Check shafts with level.

2. Determine if shafts are parallel by placing taut string between shafts and check with large square (Fig. 20).

3. Check alignment of pulleys using string along their edges. If pulleys are same width, string should touch lightly at four points: A, B, C, and D. If pulleys are of different widths, distance from string to pulley at points A and B should be the same. If possible give pulley half turn and recheck.

Recrown fibre pulleys when they wear. When belts run off the center of motor pulleys it may be due to a worn crown.

Construction Machinery Shipments

Shipments of construction machinery, other than power shovels and cranes, during the last 6 months of 1945, were valued at \$126,000,000, according to a report released July 31 by the Bureau of Census. Shipments during the fourth quarter of the year were valued at \$67,000,000, representing a 12 per cent increase over the third quarter shipments valued at \$59,000,000.

Exports accounted for a substantial portion of the shipments during this period. During the third quarter 1945 the value of export shipments amounted to about \$6,000,000, about 10 per cent of the total shipments during this period, and during the fourth quarter the shipments for export amounted to almost \$12,000,000, 18 per cent of the total shipments. Sizable exports were reported for virtually all major types of construction machinery.

Contractor's Stolen Tractor Recovered

Something is always happening in this exciting business of road contracting. The latest in the life of Frederickson Bros. out in California is a little matter of a purloined tractor.

It seems that a certain gentleman who had a saw milling operation up in the woods saw the lovely tractor along the roadside one evening. He needed a tractor himself, so loaded it into his truck and took it home.

Latest report is that the machine was recovered along with a lot of other equipment and is back at work on Frederickson Bros., US 40 relocation project near Sacramento.

S. E. Assoc. State Highway Officials Meeting—The Southeastern Association of State Highway Officials will hold its annual meeting Nov. 14 and 15 at the Tutwiler Hotel, Birmingham, Ala. E. N. Rodgers, Acting Director, State Highway Department, Montgomery, Ala., is chairman of the program committee, and H. J. Neale, Landscape Architect, Department of Highways, Richmond, Va., is Secretary-Treasurer of the Association.

A county road engineer may serve as a city engineer for a town within his county, for a particular purpose, where there is no conflict of duties between the two positions, according to a ruling of the attorney general of the state of Washington.



Postwar Parade

of New Construction Equipment and Materials

New Bulldozer for Small Tractors

1. A new small hydraulic bulldozer having all the engineering features of larger type dozers has been announced by the Industrial Division of The Oliver Corporation in Cleveland, O. Named the "Imp," this "dozer" is entirely front-mounted, leaving the rear of the tractor free for installation of other equipment. It is simple to install and is easily transported from job to job. Lifting,



New Hydraulic Bulldozer for Small Tractors

lowering, floating and hold positions are all hydraulically controlled from a single lever. The "Imp" has a reversible cutting edge, rigid moldboard and push arms and is so constructed that the underframe mounting allows for a minimum width of cut. All thrusts are transmitted to the drawbar connections.

New Hard-Facing Electrode

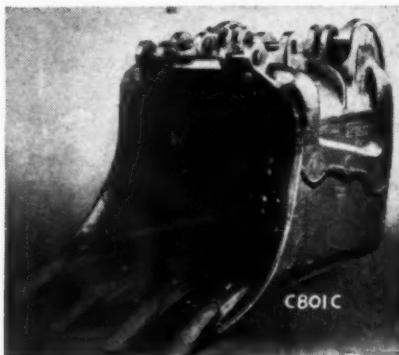
2. A new improved Coated Stoody Self-Hardening, a wear resistant electrode for hard-facing all heavy equipment subjected to earth abrasion and impact, has been announced by Stoody Co. Coated Stoody Self-Hardening differs from the former

"dipped type" electrodes in a new extruded flux coating, which is stated to improve welding characteristics and to simplify application. Coated Stoody Self-Hardening is a fabricated rod consisting of mild steel tubes filled with alloying elements. The new coating is applied to the rod by means of an hydraulic extrusion press which is claimed to greatly increase strength over dipped coatings and to materially reduce tendency to pick up moisture. Above all, coatings are completely uniform.

All-Manganese Steel Welded Dipper

3. An all-manganese steel welded type dipper has been introduced by American Manganese Steel Division of American Brake Shoe Co., Chicago Heights, Ill. When fitted with a door and bail of adequately strong design, this dipper is somewhat lighter in weight than the Amsco patented renewable lip dipper. If made with a lightly constructed door and hinges, as generally used in light weight dippers, it will not exceed the weight of any composite-type fabricated dipper that is sufficiently strong to do a good job. Over-lapping, rabbeted joints leave grooves for a welded bead. The parts are fitted together with round plugs, around which likewise weld

metal is deposited. Consequently the body of this all-manganese steel dipper is as strong and homogeneous as if made in one piece. At the same time it is possible to remove a worn



Amsco All-Manganese Steel Welded Type Dipper. Capacities $\frac{1}{4}$ yd. to 2 yd. inclusive

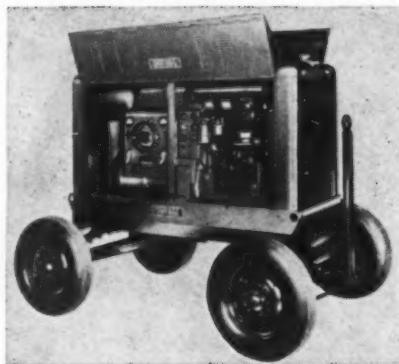
front and re-weld in place a new one without destroying the back. The Amsco all-manganese steel welded type dipper is made in capacities of $\frac{1}{4}$ cu. yd. and up. Sizes $\frac{1}{4}$ yd. to 2 yd. are made in two body pieces, front and back. Sizes over 2 yd. are made in four pieces; front, back and two side plates.

New Diesel Engine Arc Welder

4. A diesel engine driven arc welder of 300-ampere capacity, especially made for use in locations where electric power is not available, has been added to the line of The Hobart Brothers Co., Troy, O. The welder is powered by a 2-cylinder, unit-injection diesel engine, that features oil cooling, displacement blower, fuel filtration and easy starting. This engine has a $4\frac{1}{2}$ in. bore and a 5 in.

Mail Inserted Card
for data on equipment described
on these pages. See also inquiry
blank on page 128.

stroke, and is rated 47 h.p. at 1450 r.p.m. The unit is equipped with patented "Multi-Range" dual control and exclusive remote control. Other features of the welding generator includes separate excitation and 2-way ventilation, for a smoother, more productive arc at all current values. The welding generator has a rating of 300 amperes at 40 volts. Current range for welding duty is from 20 to 40 volts, 60 to 375 amperes. It is a single operator variable voltage type, with 4 laminated main poles and 4 interpoles (commutating poles). Pole pieces are removable. This unit also



Diesel Engine Driven Arc Welder

has oversize, 4-pole exciter built in on main shaft that insures quick arc recovery and build up, and eliminates accidental polarity reversal.

New Lamp for Street Lighting

5. A new improved street lamp announced by Sylvania Electric Products Inc., is adaptable to existing radial wave reflectors, and is stated to have the light output of a lamp of corresponding wattage hitherto available only in a much larger bulb size. The lamp, designated the PS-25, has a 2500 lumen, 6.6 ampere rating and can be obtained in both regular and

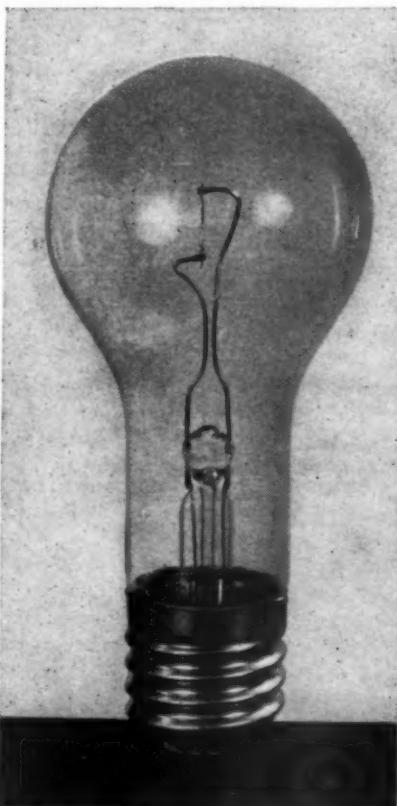
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Tandem Rollers — 3 to 17 tons
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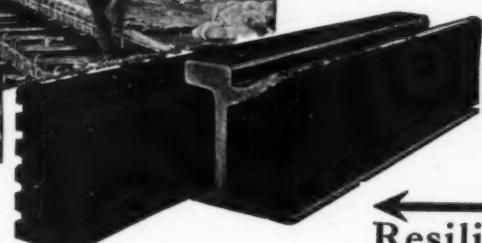
New Street Lamp

group replacement life types. The regular lamp has a laboratory life of 2000 hours with an average voltage of 21.7 while the group replacement lamp tests for 3000 hours and 23.0 average volts. Both lamps have characteristics common to the larger PS-35 lamp.

New Air-Winch

6. A new, small, lightweight air-powered hoist capable of lifting 500 lb. yet weighing only 85 lb., has been announced by the Sullivan Division of Joy Manufacturing Co., Michigan City, Ind. It has a rope capacity of 150 ft. of $\frac{1}{4}$ -in. rope, is only 18 in.

BUFFALO THE STANDARD OF COMPARISON **SPRINGFIELD**
SPRINGFIELD, OHIO, U.S.A.



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TO BE IN SOLID
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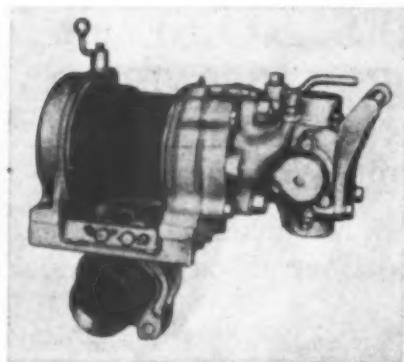
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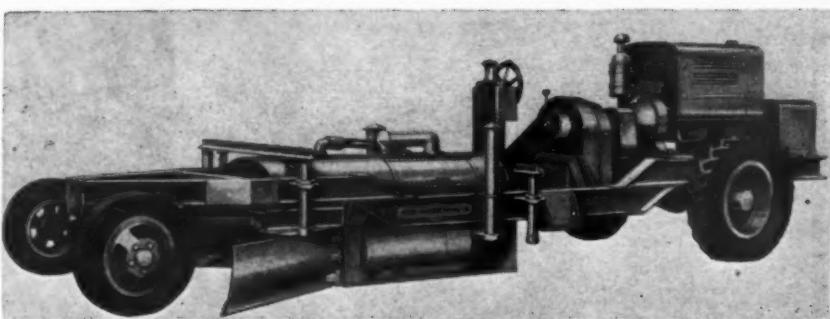
SEND FOR BULLETIN

long, 9½ in. high and 11 in. wide, and is powered by an extremely simple, 4-cylinder, reversible, piston-type air motor. Light enough for one man to move quickly from place to place, the winch can be mounted in any position on car, timber, column or bar. Regular equipment includes a set of clamps for column or bar mounting but chains or common drift bolts may



Sullivan AW-30 Air-Winch

be used to secure winch if desired. The control is positive yet sensitive and timbers can be lifted exactly into place. A conveniently operated brake-lever holds the load firmly and prevents drum from spinning.



Model 36 Wood Roadmixer

New Traveling Mixing Plant

7. A new 1-man operated, self propelled road mixer has been added to the line of road building equipment of Wood Manufacturing Co., Los Angeles, Calif. This Model 36 is stated to handle up to 4 cu. ft. windrows and to produce from 100 to 150 tons of ready-to-spread mix per hour. It has a range of 5 speeds from 2 to 14 miles per hour, forward or reverse. For mixing the Model 36 also has five speeds, ranging from 11.5 to 71 ft. per minute. All of the proved features of the Wood Roadmixer Models 48 and 54 are incorporated in the new

Model 36. The hydraulic-power lift on the mixing drum raises the drum a full 12 in., giving ample clearance for maneuvering over unmixed windrows. Steering is accomplished by hydraulic power. As used on the larger Wood roadmixers, the burner system is of the compressed air, fuel oil type; the liquid binder is controlled by a bypass valve; with meter, gauge and thermometer within full view of the operator.

Industrial Engines

8. Chrysler individual engines, with many war-developed improvements, are again available for the construction industry. Models Ind. 5, Ind. 7

THE STREAK (7M) 2-inch
Complete line of pumps ranges
in size from 3,000 gallons per
hour to 90,000 gallons per hour.

Barnes Automatics

"33,000 for 1" Pumps

HERE never will be a better time than now to get all the facts about Barnes "33,000 for 1" Pumps. How they will deliver not 1,000! — not 10,000! — but 33,000 gallons of water for one gallon of gas used. What's more, check up on deliveries of comparable pumps.

Barnes (7M) Automatic Centrifugal Pumps (The Streak) are available for immediate delivery. You don't have to wait. Order 1, or order 100. Your order will be filled upon receipt. You can "go places" with Barnes. You can do more with Barnes.

For sale by leading distributors in all principal cities.
If there is no distributor near you,
write, phone, or wire.



BARNES MANUFACTURING CO.
Quality Pump Manufacturers for 50 Years MANSFIELD, OHIO

can be quickly strapped across the shoulders and buckled firmly in a comfortable position. It is packaged in an easily carried, sturdy aluminum case for storage when the equipment is not in use.

MANUFACTURERS' LITERATURE

Financing Purchase of Construction Equipment

11. How contractors can arrange financing for their purchases of construction equipment is explained in a booklet issued by C.I.T. Corporation, New York, N. Y. This plan of financing makes it possible for contractors to acquire all types of construction equipment without depleting their working capital and without facing top-heavy maturities at periodic intervals.

Traveling Mixing Plant

12. Complete specifications with illustrations covering features on the self-propelled Wood roadmixer Model 36, the latest addition to the line of Wood Manufacturing Co., Los Angeles, Calif., are given in a 4-page bulletin issued by the company. This new 1-man operated model is particularly adaptable to small jobs, such as shoulders, patch jobs, parking areas and detours, as well as city, county and state road maintenance and general surfacing construction.

Floor Treatments

13. A new specifications book covering floor treatment—concrete and wood—has been issued by Truscon Laboratories, Inc., Detroit, Mich. The book has five sections as follows: (1) "Integral" hardeners—metallic types, including non-slip hardener. (2) Chemical hardeners—that is liquids which are brushed or swept over concrete floor. (3) Concrete Dye, which is a patented article with Truscon. (4) Surface coatings: rubber base floor coating — transparent sealer — and non-slip mastic or covering. (5) Wood floor preservatives, including varnish.

Allis-Chalmers Catalog

14. Recently released by the Allis-Chalmers Tractor Division is an attractive 32 page catalog featuring the

The **RIGHT** Answer to **EVERY VIBRATOR PROBLEM** in the Concrete Construction Field!

Stick this in your hat for future reference: For each and every purpose to which Vibrators are applicable in the concrete industry, we can supply the equipment that will give you not only the best and fastest placement, but also the maximum of dependability and trouble-free service. Our long, famous JACKSON line includes many vibrators of both the internal and external type; the finest equipment available for:

General Construction ★ Light Construction ★ Mass Concrete ★ Hard-to-get-at Places ★ Form Vibrating ★ Floors, Streets and Highways ★ Pipe Manufacturing ★ Vibration Tables, etc.

If you have a Vibrator problem, by all means let us show you how to solve it to best advantage. Drop us a line. No obligation, of course.

ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON MICHIGAN

newly improved AD motor grader. This booklet stresses the capacity, performance and design of the AD, giving special attention to clearance, blade construction and range, electric brakes, sturdy frame and its General Motors 2 cycle, 75-h.p. engine. The catalog contains a 3-page illustration of the AD which is easily adapted to display purposes. A specification sheet lists data concerning weights, its six forward speeds from 1.5 to 16.6 mph., lifting mechanisms, tire sizes, fuel capacities and engine dimensions.

The catalog is available at any Allis-

Chalmers crawler tractor dealer or can be obtained by writing to Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee 1, Wis. Attention is invited to the catalog form No. MS-300A—which should be used when referring to this new AD bulletin.

Bulldozers

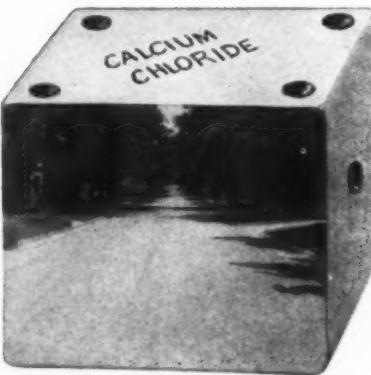
15. Three models of Trojan bulldozers are covered in a bulletin of Contractors Machinery Co., Batavia, N. Y. Outstanding features of the bulldozers are outlined and specifications are given.

Diesel Tractor

16. Numerous features of the new HD-7 Diesel tractor are emphasized in an illustrated 24-page catalog issued by Allis-Chalmers Manufacturing Co., Milwaukee, Wis. Given prominent display in this catalog are facts about the General Motors 2 cycle engine, the unit injector, transmission construction, and the popular "Positive" sealed truck wheels. Specifications list pertinent facts and figures about the HD-7, such as its 60 drawbar horsepower, its five speed ranges, engine dimensions, fuel capacities, shipping weights and track design.

THE CALCIUM ROAD...

a Natural



**for Low-Cost
Federal-Aid
Secondary Roads**

You get the maximum mileage of road improvement that can be obtained from your appropriation. You use local materials—aggregates and binder soils and consolidate them with calcium chloride.

Initial costs are low—your budget provides more miles of improvement. Maintenance requirements reduced—road metal saved. Such roads are smooth, firm and dust-free. They are long lasting, all-weather roads that give good service all year 'round.

Materials and methods are explained in our booklet, "Surface Consolidation and Maintenance." It is sent on request.

CALCIUM CHLORIDE ASSOCIATION
4145 Penobscot Building • Detroit 26, Michigan

More Miles of Better Roads—

CALCIUM CHLORIDE
Consolidation

Garbage Collecting Unit

17. The Sanivan, a garbage collecting unit having "yard-by-yard" compression loading plus immediate mechanical full discharge, is illustrated and described in a catalog of Sicard Industries, Inc., Watertown, N. Y. With this unit each hopper-full is compressed before it joins the rest of the load, compression taking place in the hopper. The compressor plate serves as the hopper cover. This reinforced, double thick steel plate is actuated by hydraulic pistons, with power supplied by the truck engine.

Welding and Flame Cutting

18. A service bulletin covering recommended practices for welding and flame cutting of wrought iron pipe and flat rolled products has been issued by A. M. Byers Co., Pittsburgh, Pa. The book contains a comprehensive welding chart that can be removed and tacked on a wall.

Hard-Facing Alloys

19. The Colmonoy Formweld Process, used extensively by the U. S. Army for hard-facing tank sprockets, and now available for civilian use, is described in a catalog issued by Wall Colmonoy Corporation, Detroit, Mich. Full information on the complete line of Colmonoy hard facing alloys, testing from 15 to 68 Rockwell C. is given, and typical applications are illustrated.

Street Flushers

20. Sicard street flushers are illustrated and described in a circular issued by Sicard Industries, Inc., Watertown, N. Y. Details of the flushers are pictured and explained.

Hoists, Derricks, Cranes, Etc.

21. The complete line of products of the American Hoist & Derrick Co., St. Paul, Minn., is covered in a catalog issued recently by the company. The products include blocks and sheaves, cranes, piledrivers, derricks, hoists, wire rope clips, cane handling machinery, and Marine deck machinery. Descriptions of the equipment and illustrations on jobs are included.

Automatic Clutch

22. A bulletin illustrating and describing its automatic clutch has been issued by Salsbury Motors, Inc., Los Angeles, Calif. Included in it are general dimensional and horsepower capacity information and general operating characteristics of the two models illustrated in bulletin.

Financing Purchases and Sales of Construction Equipment

23. A special financing plan for the construction industry that provides complete facilities through which distributors can "handle more business with less risk" by making it easier for them to buy, sell and rent equipment, is explained in a booklet issued by C.I.T. Corporation, New York, N. Y. In developing this plan, the views of manufacturers, distributors and contractors were obtained.

Left Turn Accidents

(Continued from page 79)

for acceleration, deceleration lanes or left turn refuges. There are at the present time left-turn signals at the several signalized intersections and this type of control was given due weight in the analysis. This highway carries a through movement in either direction of approximately 5,000 vehicles per day with an average speed of approximately 22 mph. The entire paved section and the raised medial divider are built of Portland cement concrete.

Accident records on US99E were for a period of seven years (1938-1944, inclusive) and an average year of the seven years was used for this study. The traffic density data were as of 1941. US99W had a shorter sample of accident data, being for a four-year period (1941-1944, inclusive) with an average year of the four years being used in this study. The traffic density data in this case were also put on a 1941 base.

Analysis

As mentioned hereinbefore, all accidents occurring on the two sections of

Use **KOTAL** **Master Mixes** for Bituminous Surfaces **All Year 'Round**



Eight Working Features of KOTAL Master Mixes

EASY TO USE. Quickly mixed, ready to lay. No preheating or drying.

STABILITY. Cure quickly and permanently. Do not shift, ravel or pick up.

Open sooner to traffic.

WORKABILITY. Do not adhere to equipment. Work easily.

LONG-TERM STOCK PILES. Can be stock-piled for many months without losing workability.

SAVE TIME. Quickly made stock piles ready for immediate use without frequent fresh mixes.

SAVE LABOR. Actual road records prove fewer labor hours required.

SAVE MONEY. Savings in time and labor mean economies in road costs.

EXTEND PAVING SEASON. All-weather workability permits more months of operation.

It's easy to use KOTAL Master Mixes

It's easy to keep bituminous surfaces in condition all the year 'round with KOTAL Mixes. These cold mixes are prepared by advanced scientific methods, using high-grade cutback asphalts or road tars. KOTAL Mixes, tested and proven in more than six years of hard use, produce tough, durable surfaces and solid repairs that resist stripping and stand up indefinitely.

IT'S THE KOTAL PROCESS THAT MAKES THE DIFFERENCE

Write for your copy of booklet which tells the story of KOTAL Master Mixes. We will also send you the name of your nearest supplier.

KOTAL COMPANY

360-68 Springfield Ave. ★ Summit, N. J.



KOTAL Master Mixes

The Advanced All-Weather Aid in Building Better Roads

FORD TRUCKS LAST LONGER!

**OVER 1 MILLION
FORD V-8 TRUCKS
IN USE TODAY!**

The Ford logo, which is the word "Ford" in a script font inside an oval.

highway studied were analyzed and only those accidents which were caused directly or indirectly by a left-turn movement—leaving the highway—were considered. Tabulations for the several intersecting roads and streets were prepared whereby the number of accidents caused by left turn movements were coupled with the number of vehicles making this left turn. These data were brought together within the several left-turn volume groups and were reduced to an average intersection for each of the several groups.

In order to correlate those data the following formula was evolved:

where

V_L = Average left-turn volume per day

A_L = Accidents per year caused by left turns

F = Frequency Index—frequency
of accidents per year caused
by one left turn per day
(when made for one year)

The frequency index, which is the frequency of accidents per year caused by one left turn per day (when made for one year), was determined so that a relationship between the several frequencies within the various volume groups would be known. A recapitulation of the basic data through the use of the foregoing formula is contained in the table shown. These data are also plotted on the graph (page 79).

The sample studied was not large enough to cover all of the several volume groups for the rural section.



TUTHILL Highway Guard has that combination of features Highway Engineers like so well: A high degree of *safety*, *easy installation* and *low upkeep expense*. Made of strong steel, with panels cut to convenient length, this Guard is *easy* to install. Its strength to resist impact, and yet stand erect, means greater safety, besides a neater-looking, more permanent job. Proof? The hundreds of TUTHILL Guards along America's scenic highways. Available for maintenance or installation. *Write for details.*

Pacific Coast Manufacturers and Distributors:
U. S. SPRING & BUMPER CO., Los Angeles, Calif.

CLEAN UP LEAVES *—the Economical way!*



THE TRUCK LOADER

Also cleans up refuse, dirt, snow and similar material—quickly, easily.

- **Capacity:** Large size (for leaves and snow), 1.1 cu. yds. Standard size (dirt, refuse, etc.), $\frac{1}{2}$ cu. yd.
- After initial installation can be attached or detached in a few minutes using standard hoist truck of $1\frac{1}{2}$ to 5 tons capacity.
- One-man operation. Truck driver operates loader, using truck's hoist for lifting power.
- Operations in front and in full view of driver.
- Interchangeable with snow plow, using same frame. Send today for circular giving full details.

TRUK-LODER CO.

but the data in the other volume groups were adequate.

This preliminary analysis shows a definite trend in that the smaller the left-turn volume (V_L) the higher the frequency index (F). This was true for the urban section, the rural section, and the composite section. It is to be noted that the rural index is somewhat higher than the urban index and this is no doubt occasioned by the fact that the through volume was smaller and that the speed was higher. However, the difference between the urban and rural indices is so small that there is basically no variance.

Conclusions

This analysis brought out that the frequency of accidents decreases as the number of left turns increases. That is to say, a frequency of 0.39 accidents per year is occasioned by one left turn per day (when made for one year) in the left-turn volume group 0.49 and decreases hyperbolically to a minimum of 0.003 accidents per year for one left turn per day in the left-turn volume group of 500 and over. Stated in a different manner, in the first volume group, 0-49, one accident per year may be expected for every 26 left turns per day (when made for one year) and in the latter volume group, 500 and over, one accident per year may be expected for every 333 left turns per day.

These data show that the infrequent left turns, when the through volume and speed are consistent throughout a section of highway, cause accidents in a greater frequency than do the frequent left-turn movements. This is a result of the surprise element that the occasional left turn creates.

*

Texas Finishes First 100 Miles of Secondaries

During July the Texas state highway department completed the hundredth mile of farm-to-market road let this year under its current 3-year 7,500-mile program. Nearly a thousand miles have been let, and another 250 miles will probably be contracted before the end of 1946. Costs are averaging \$6,000 per mile.

*

New Jersey road repairs due to damage by storms in the winter of 1944-45 are to be paid for with a \$500,000 appropriation from funds voted by the legislature. This grant, to aid municipalities and counties, was allowed due to the abnormal cost resulting from the severity of floods and heavy snow falls.

This HEAVY-DUTY
WISCONSIN
Air-Cooled Engine
IS AVAILABLE IN 4
SIZES . . . 4 TO 9 H.P.

Illustrated above is the Models AEH to AHH series of 4-cycle single cylinder Wisconsin Air-Cooled Standard Engines, to which the following specifications apply:

MODEL	AEH	AFH	AGH	AHH
Bore.....	3"	3 1/4"	3 1/2"	3 5/8"
Stroke.....	3 1/4"	4"	4"	4"
Cu. in. Displ.....	23	38.2	38.5	41.3
Hp. Range.....	4-6	5-7	6-8.5	7-9
Weight.....	130 lbs.	170 lbs.	175 lbs.	180 lbs.

If your equipment calls for an engine within the above power range, it will pay you to give serious consideration to the Wisconsin line . . . noted for rugged, heavy-duty serviceability and thorough-going dependability.

In addition to the engines listed above Wisconsin 4-cycle single cylinder engines are also available in 2 to 4 hp. sizes, and V-type 4-cylinder engines can be supplied in a power range of 13 to 30 hp. Detailed data furnished on request.

WISCONSIN MOTOR Corporation
MILWAUKEE 14, WISCONSIN
World's Largest Builders of Heavy Duty Air-Cooled Engines

1 - CONTRACT 8 - JOBS 11,000 Cu. Yards of Concrete

115 Moves

A 3/4 yd. Strayer Portable Concrete Plant averaged 24 cu. yards an hour under severe conditions, pouring 150 batches in one 5 hour period and paid for itself several times over. That was before the war — today's Strayer plant is easier and faster in operation thanks to fingertip hydraulic controls on all gates and many other design refinements.



Write today for complete data on the Strayer Portable Concrete Plant that combines vertical conveyor to 3 compartment 20 cu. yd. Bin Storage — Weighing Aggrometer — Cement Pre-mixing — Accurate Water Control — Engine Drive. All mounted on 8-Wheeled chassis permitting moving from job to job.

STRAYER Portable CONCRETE PLANTS

Eric Steel Construction Co., 368 Geist Rd., Erie, Pa.

BUCKETS • AGGREGATES • PORTABLE CONCRETE PLANTS



Exclusive features, expert design and superior construction characterize Owen buckets. Long life with dependable service has resulted wherever Owens have been put to work.

The latest catalog is now available. You'll doubtless want to look it over, keeping your current excavating, material handling and dredging equipment demands in mind. Write for the catalog TODAY.

The OWEN BUCKET Co.
6676 Breakwater Avenue Cleveland, Ohio
Branches: New York Philadelphia Chicago Berkeley, Cal.



National Program for Secondary Road Development

(Continued from page 101)

to accept the improvement of the culverts and bridges on the secondary road systems on any route in any county without the intervening road work, since such an improvement is basic. There are innumerable counties in which the drainage structures of temporary character absorb the available road funds. They will continue to do so until they are built to endure the floods, the trucks and other heavy equipment moved over them. Just at the moment the lack of culvert and bridge materials and their high cost do not recommend such a program. This will change not too long in the future.

These possibilities are only brought forward to illustrate the flexibility of the Federal regulations to meet any conditions.

Recently one of the county engineer consultants reported that his inquiries in several states indicated that the

custom was general of dividing the combined road funds among the supervisors' districts. When again divided into the road mileage in each district, the amounts per mile could only be used as maintenance funds. Obviously, no federal regulations for construction of new projects can meet such a condition. Neither can any progress be made. If the county is a unit, it must be so administered. There must be a construction fund and a maintenance fund, and so administered.

In summary, under the uncertain postwar conditions, it can be fairly said that good progress has been made by the county, the state and the federal officials in the selection and approval of the first increments of the secondary road systems, that a fair start has been made upon the construction program, and that on the whole a reassuring spirit of cooperation and mutual assistance exists between the responsible officials. As conditions affecting road construction become less uncertain the way will be easier.

I have faith in the future of our joint undertaking.

WITH THE MANUFACTURERS & DISTRIBUTORS

New Lima Distributor

Lima Locomotive Works, Incorporated, Shovel and Crane Division, with factory and main offices in Lima, O., has appointed the Foulger Equipment Co., Salt Lake City, Utah, as sales agent for Lima shovels, cranes and draglines in the state of Utah and southwestern Wyoming.

R. E. Wagenhals Promoted

R. E. Wagenhals, formerly quality control engineer, has been appointed director of quality control for all Bearing Divisions of The Timken Roller Bearing Co., Canton, O. He will coordinate all quality control activities involved in the manufacture of Timken Bearings. He began his career at the Timken Co. in 1943 as a member of the Factory Engineering staff.

FORD TRUCKS LAST LONGER!



MORE FORD TRUCKS IN USE TODAY THAN ANY OTHER MAKE!



CHECK...

THESE FACTS and FEATURES

- ✓ LOW COST
- ✓ ALL WELDED CONSTRUCTION
- ✓ EXCLUSIVE GOOSENECK CONSTRUCTION
- ✓ I-BEAM AXLES
- ✓ LOW UPKEEP COST
- ✓ CONSERVATIVE TIRE RATING

ENGINEERED to meet EVERY TRAILER NEED

11-200 Tons

THE LEADER IN THE TRAILER FIELD WITH 15 YEARS EXPERIENCE IN THE SCIENTIFIC MANUFACTURE OF HEAVY DUTY TRAILERS DESIGNED TO MEET THE MOST EXACTING REQUIREMENTS.



LA CROSSE TRAILER CORP.

LA CROSSE, WISCONSIN

S. E. McCrum Promoted

G. A. Sabin, Director of Advertising, The Colorado Fuel and Iron Corporation, has announced the appointment of Sidney E. McCrum as advertising manager of Wickwire Spencer Steel Division, effective July 1, 1946. Mr. McCrum was assistant advertising manager of Wickwire Spencer Steel Co. prior to the merger of that company with the Colorado Fuel and Iron Corporation.

Dupont Veteran Retires

H. K. Babbitt, production manager of the Special Products Section of the Du Pont Company's Explosives Department, retired recently. He rounded out forty years of service with the company, starting as a draftsman in the Engineering Department. Transferred to the Explosives Department, he was superintendent of several plants and, in 1911, he went abroad, studying explosives manufacture in England and Germany. He returned to the Pompton Lakes Works, becoming manager in 1918, a post he held for seven years. Then he was made assistant director of the Special Products Division in Wilmington and later

director until 1934. Since that time, he has been in his present position.

The Special Products Section will be consolidated with the Black Powder Section of the Explosives Department under the direction of H. C. Peinert, production manager.

Huber Takes South America Post

Fred Huber, formerly of the Technical Service Department of The White Motor Co., Cleveland, O., has been named export service manager covering the West Indies, Central America and all of South America except Brazil, Argentina, and Uruguay. He has already left for the southern territory, and is touring Mexico to assist distributors in that country before proceeding to San Juan, Puerto Rico, where he will make his home. As export service engineer covering the southern countries, Mr. Huber will now be charged with the responsibility of advising and con-



F. Huber

sulting on motor transport problems and representing White interests in South and Central America and the West Indies.

Graver Tank Appointments

Harold C. Conners and Harold R. Fosnot have been named by the Graver Tank & Manufacturing Co., East Chicago, Ind., to head the firm's Chicago area sales activities. Both war veterans, Conners will handle steel plate sales, while Fosnot will represent the Graver Process Equipment Division, specializing in water conditioning equipment.

Ward LaFrance Appoints Rice

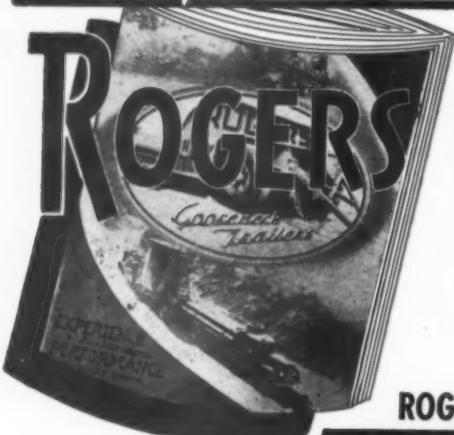
Appointment of W. P. Rice as General Sales Manager of Ward LaFrance Truck Division, Great American Industries, Inc., Elmira, New York, is announced by A. A. Frank, Vice-President and General Manager. He will be directly in charge of all sales and service activities covering all products of the Division both domestic and export. Rice entered the industry in 1921 with the Fageol Bus

(Continued on page 129)

FORD TRUCKS
LAST LONGER!



Half of all
Ford Trucks
in use
are at least
9 years old!



TRAILER CATALOG

is "BULGING" with
VITAL FACTS & INFORMATION
YOU'LL SURELY WANT ...

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TODAY

ROGERS BROTHERS CORPORATION • 110 Orchard St. • Albion, Pa.

EXPERIENCE
builds 'em

PERFORMANCE
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FOR CITY STREET
SOIL-CEMENT BASE....



ARIENS
AGGMIXER!

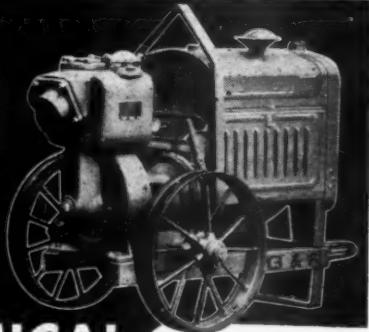
ARIENS AGGMIXER is designed especially for mixed-in-place construction, and to be used in connection with other general purpose road equipment, especially where aggregates are used such as all types of bitumens, cements, clays, chlorides, etc. These materials are mixed without being displaced on the road surface. It's the swirling, chopping action of the tires that thoroughly pulverizes, mixes and aerates the aggregates with the binder used—rapidly and economically. Safe and easy to operate, ARIENS AGGMIXER is adjustable to any tractor . . . made in 4 sizes, normal cutting widths 4', 5', 6' and 7'.

Write for complete job facts and name of nearest distributor.



ARIENS COMPANY
BRILLION • WISCONSIN

SIMPLE
STURDY
and
ECONOMICAL



Gorman-Rupp centrifugal pumps will save time and money on any pumping job. Their simplicity of design and rugged construction insures trouble free performance. They will pump as much or more water for more continuous hours than any pump on the market. Your nearest distributor will assist you in choosing a Gorman-Rupp pump to fill any requirement.

Order a Gorman-Rupp self-priming, centrifugal pump from your distributor, put it on the job for thirty days. If it isn't the best pump you ever used we will take it back and it won't cost you a cent.

THE GORMAN-RUPP COMPANY
MANSFIELD • OHIO

FORD TRUCKS
LAST LONGER!

More Ford Trucks
in Use Today
Than Any
Other Make!



N. E. Traffic Meeting

(Continued from page 98)

Mr. Greene cited his own state's accident statistics as proof of the value of a well integrated safety program. Connecticut has seen a 42% increase in mileage, but no increase in traffic deaths, comparing the first four months of 1946 to 1945.

W. H. Sharp, Connecticut state highway engineer, told of the recent statewide speed zoning survey, pointing out how speed checks were made and tied in with accident and road characteristics studies to develop the recommended top speeds allowable.

Holmes Cites Mistaken Beliefs

Popular but erroneous beliefs concerning urban traffic flow principles were pointed to by E. H. Holmes, Chief of Highway Transportation, U. S. Public Roads Administration, as proof of the need for more study of urban traffic. Holmes pointed out that in the past, the belief held that through-traffic was a considerable portion of urban flow and should be routed around the urban areas. This has been shown by PRA studies to be false. It is now known that through-traffic is a small minority—that nearly all vehicles originate or are destined to points within or close to the business district. Holmes exploded the myth of the near past that lane capacity decreases with more highway lanes. Recent PRA studies show the opposite to be true.

Mr. Holmes told of the origin and destination studies made by the PRA, stressing the importance of obtaining basic data. He stated that in medium sized cities about ten cents per capita is the cost to conduct basic studies. Holmes said, "the \$100,000 for planning in Boston would about pay for one-tenth of a mile of express highway in the congested area. Isn't it better to sacrifice one-tenth of a mile of expressway to assure proper location and planning of the entire facility?"

Property Developers Should Provide Parking Space

Nathan Cherniack, economist, Port of New York authority, urged city officials to enact ordinances requiring parking lots or garages to be an integral part of all new buildings built. He told of 8 cities that now have such legislation, and 9 cities require provision for loading and unloading of trucks. Cherniack advocated setting a 5 to 10 year deadline after which all existing traffic generators should have provided offstreet terminal facilities.

How Philadelphia eliminated many of her traffic congestion and accident headaches was told by Robert Mitchell, city traffic engineer. He described the surveys made, and the action taken in prohibiting parking on most of the downtown streets, citing the decreases in motor vehicle accidents and increase in speed of traffic movement.

Lloyd Braff of DeLeuw, Cather and Company, Engineers, detailed the methods of making parker questionnaire surveys.

City Planning

Public transit and city planning were the topics discussed the second afternoon of the conference. Harold Hammond of the American Transit Association declared that transit is already doing a great deal to keep traffic congestion down, but that city planners, traffic engineers and municipal officials can help transit to do a better job in this respect. He urged curb parking restriction where it interferes, and the use of one-way streets. He opined that 10 to 30% of people who now use autos to ride downtown would change to transit, were such traffic improvements made.

Peter Hale, New Haven, Connecticut, city planning engineer, said that a magnificent job of city and traffic planning has been done on paper but an alarmingly small amount of work has gone any further. While the planner has been developing the paper work, the traffic engineer has been out solving the immediate traffic problems, not aware of what the planner was doing. He urged them to work together more closely.

Grant Mickle, Automotive Safety Foundation, outlined three steps necessary to proper traffic planning: (1) city and urban county should have a regional planning agency, which should adopt a master plan of street and traffic facility growth; (2) arterial streets should be used as boundaries for neighborhoods and not go through them; (3) an official program for studying parking is needed by every urban area.

He cited the soaring accident tolls as proof of need for more driver training. He said that in Cleveland, high school students who took the driving course had only 50% as many accidents as other drivers.

Boston Congestion

Recent traffic volume counts show figures as high as found in 1941 on Boston arteries, and during July of last year the Sumner tunnel averaged 26,000 cars per day, the highest monthly average yet sustained. These facts were related by Joseph Cressy,

Manager of the Massachusetts Highway Planning Survey. He went on to state that conservative forecasts indicate a 50% increase of traffic by 1961 over what it was in 1941, but that he expected Boston to get its 50% in 10 years. He cited an immediate need for off-street parking space for at least 7000 cars.

Cressy advocated a complete study of parking with a view toward providing off-street facilities right away.

Central Artery

Phillip Kitfield of the Massachusetts Department of Public Works outlined the state's contemplated highway construction program and described the proposed central artery, a 6-lane elevated structure superimposed on an 8-lane surface highway, designed to feed traffic into and out of Boston's downtown area. He said that it will cost 50 million dollars, half of which will go for costs of construction, half for property damage.

Making a plea that "we should do first things first," William S. Parker, Chairman of the Boston Planning Board criticized Governor Tobin's action in asking the Legislature to appropriate money for a Charles River highway back of Beacon Street. Parker described how the central artery, one of the needed "first things," will tie in with an additional tunnel to East Boston.

High-Level Bridge

Indicating that the First Boston Corporation has indicated a desire to invest 40 million dollars or more in the project, William J. McDonald, Boston Realtor, described at length his plans for a waterfront terminal, a high-level bridge connecting with the airport, and a six-lane motor skyway over the city. The plans have been submitted to the Port Authority.

Theodore McCrosky, Executive Director of the Greater Boston Development Committee, Inc., told the Conference that Boston should first break its worst traffic congestion before constructing facilities to accommodate the maximum traffic streams. He cited New York City's example where giving priority to north-south expressways, the heaviest traffic stream direction, has encouraged an increase in N-S traffic which complicated the already seriously congested condition of the east-west traffic.

McCrosky described the Greater Boston Development Committee's four point highway traffic program for 1946 adoption covering (1) off-street parking facilities; (2) a new vehicular tunnel to East Boston; (3) Express highway connections in East Boston; and (4) the central artery in Boston.

Inquiry Blank and Advertisers' Index

Check reference to advertisement or to items of equipment or materials on which you wish to receive information. Give you name and address in the space at foot of page (if convenient, please print or use typewriter), detach page and mail to ROADS AND STREETS, Readers' Service Department, 330 South Wells Street, Chicago 6, Ill. We will pass your inquiry along to manufacturers and see that you get desired information promptly.

Check below advertisements on which you wish information on products featured:

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*Advertisers with * are represented in the 1945 edition of Powers Road and Street Catalog and Data Book. Please refer to it for additional information on any of their products.

Check other products below on which you wish us to obtain information for you:

AGGREGATE:

- Bins and Hoppers
- Conveyors
- Crushers
- Portable Plants
- Screens

BITUMINOUS:

- Batchers
- Finishers
- Distributors
- Dryers
- Heaters
- Plants (central)
- Plants (travel)
- Stabilizers

CONCRETE:

- Batchers
- Buggies and Carts
- Finishers
- Mixers (under 1 yd.)
- Mixers (1 yd. up)
- Pavers
- Road Forms (1000' set)
- Tower
- Truck Mixers

CRANES & CLAMSHELLS:

- Crawler Mounted
- Truck Mounted
- Piledrivers
- Hoists, derrick type

GRADERS:

- Blade, self propelled
- Blade, pull type
- Blade, under truck
- Elevating

LOADERS & TRENCHERS:

- Front-end loader (tractor mounted)
- Loader, bucket type and belt type
- Trencher or Ditcher

HAULING EQUIPMENT:

- Dump Trucks, self-powered
- Dump Wagons, tractor drawn
- Flatbed Trailers
- Other Trucks

PUMPS:

- Centrifugal
- Concrete
- Diaphragm
- Mud Jacking
- Piston
- Wellpoint

POWER UNIT: (Independent)

- Gasoline
- Diesel
- Electric

ROLLERS:

- Power (Smooth)
- Pneumatic Tire
- Sheepfoot

TRACTORS:

- Crawler
- Rubber-Tired

TRACTOR EQUIPMENT:

- Dozers
- Power Control Units
- Rippers
- Scrapers, tractor drawn
- Scrapers, self-powered

BUCKETS:

- Clamshell
- Concrete
- Dragline
- Orange Peel

SHOVELS & DRAGLINES:

- Crawler (under 1 yd.)
- Crawler (1 yd. up)
- Truck Mounted

ROCK DRILLS & AIR TOOLS:

- Air Compressors
- Backfill Tamers
- Clay Diggers
- Concrete Vibrators
- Drills, cable tool

MISCELLANEOUS:

- Buildings, portable
- Earth Drills, power
- Light Plants
- Lubrication, Service Truck
- Mowers, field Power Saws
- Soil Stabilizers
- Snowplows, rotary
- Snowplows, v or wing
- Spreaders, sand or cinders
- Street Flushers
- Street Sweepers-brooms
- Welders (or cutting torch)
- Hydraulic Jacks
- Hydraulic Control Equipment
- Hand Tools

Be sure to fill in name and address below:

Title

Your Name.....or profession.....

Name of your company or governmental department.....

Type of work for which equipment will be used.....

Street Address.....

City.....State.....County.....

Better WEED CONTROL this Season WITH 2-4-D

Tested and approved by leading agricultural colleges.



The Perfected 2-4-D WEED KILLER WILL DO THE JOB!

- COMPLETELY WATER SOLUBLE
- WILL NOT DETERIORATE

Packaged in 8-ounce, quarts, gallons, 5-gallon and 50-gallon containers
Write or wire dept. (5) now for quantity discounts

HOWARD HANSON & CO.
Agricultural Chemicals and Hormones
BELOIT, WISCONSIN

NOW AVAILABLE

One-man Diesel Valve Spring Tool

SAFE-N-EZY
Valve Spring
Depressor
CUTS Diesel
Maintenance
COST!



Write
Today
for Prices
and Folder

The SAFE-N-EZY Valve Spring Depressor is designed for one-man operation in dismantling and assembling Diesel engine valves. Compresses valve spring to any point, holds it there. Mechanic can have both hands free. Easy to apply. Sizes to fit all modern Diesel engines. Rugged, light, easy to store. Makes Diesel valve dismantling and assembly safe, easy, quick.



PAXTON
DIESEL ENGINEERING COMPANY
OMAHA 5, NEBRASKA

(Continued from page 125)
Branch in Oakland, California, later associated with GEIC and GMAC Divisions of General Motors and subsequently became a sales representative and manufacturers agent in the independent parts field. In 1938 he returned to GM with Chevrolet Motor Division, leaving the division upon the outbreak of War to serve as Assistant to the Chief of Industrial Operations, Tank-Automotive Center, Ordnance Department, Detroit. Upon completion of this service in 1943 he joined Willys-Overland as Assistant to the General Manager of the Jeep Division, with headquarters in Detroit, supervising war products sales.

Hagenbuch Named Assistant Vice President

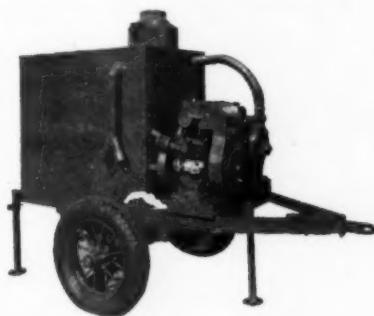
C. W. Hagenbuch has been appointed assistant vice president Sheffield Steel Corp., Kansas City, Mo. He has been associated with Sheffield for 26 years. In 1920 he came to the company, then known as the Kansas City Bolt & Nut Co., with a degree in mechanical engineering from the University of Kansas and several years' experience in the engineering field. His first position was plant efficiency engineer. He has since served progressively as head of the Cost Accounting Department, in the development and sales of products—including forgings and specialties such as Grinding Media, as office manager and production manager, and manager of Grinding Media. Under his direction, as assistant vice president, will be the development and merchandising of new products, including a number of special products now being produced, as well as overall production and mill scheduling of all Sheffield products.



C. W. Hagenbuch

DRILL without DUST

KADCO EQUIPMENT Reduces Costs Eliminates Hazard



Use KADCO Dust Control equipment on your rock drills for greater drilling footage—less blacksmithing—longer tool life—better working conditions. Available in a wide range of sizes for all operations. For sale or lease.

Write for Information

KADCO CORPORATION
LONG ISLAND CITY, N. Y.

A complete reliable guide for the engineer and contractor
VOLUME II—DATA BOOK FOR CIVIL ENGINEERS
SPECIFICATIONS AND COSTS



By

ELWYN E. SEELYE,

Consulting Engineer

The second volume of a three-volume series that provides a concentrated collection of the data necessary to design, place under contract, and construct all types of civil engineering structures. Typical specifications, given under eleven different headings, are brief, yet detailed, and written in clear, correct English, not liable to misinterpretation. Relative costs of different materials and methods and a general idea of costs for selective design and budget purposes are provided. Contents include: Contract Documents; Structural Specifications; Airports, Roads, and Railroads; Bridges; Docks; Dams; Drainage, Sewers, Sewerage Treatment, and Water; Costs; Glossary; Specifications Index; Cost Index. 325 Pages \$6.75

ON APPROVAL COUPON

JOHN WILEY & SONS, INC.

440 Fourth Ave., New York 16, N. Y.

Please send me a copy of Seelye's Vol. II—**SPECIFICATIONS AND COSTS** on ten days' approval. If I desire to keep the book, I will remit \$6.75 plus postage; otherwise I will return the book postpaid.

R&S-8-46

Name
Address
City Zone State

Employed by
(Not valid outside U. S. and Canada)

New District Sales Engineers

The appointment of three district sales engineers—for New York, Chicago, and Cleveland—has been an-

nounced by The Steel and Tube Division of The Timken Roller Bearing Co., Canton. O. Sherman R. Lyle, of Canton; William Earle Bryden, of Akron; and Alfred J. Kinnucan, of Philadelphia, are the appointees.

Round and Round They Go. All Over the World! EWC WHEELS

We've been making good wheels for more than half a century—and had begun to get a little complacent about it—until people began telling us what a job EWC Wheels were doing all over the world. Our accumulated experience, and modern engineering combine to produce outstandingly fine wheels to meet every need. Now, with the most modern equipment to produce disc wheels, we are in a doubly fine position to work with you.

Write for special information about EWC Wheels.

EWC WHEELS
Electric Wheel Co., Dept. NS, Quincy, Ill.

Shunk
and Ice Removal
BLADES

Proved record of superior performance. Made of specially developed steel to withstand severe service conditions.

FOR ALL TYPES AND MODELS OF SNOW PLOWS

Various widths, lengths, thicknesses—flat or curved—standard or special—punched ready to fit your machine.

SHUNK SAW-TOOTH ICE BLADE

Amazingly effective. Thoroughly breaks up and removes heavy, slippery ice and snow formations. Replaces all types of snow plow blades or maintenance units. Write for Bulletin and name of nearest distributor.

AEN

Shunk
MANUFACTURING
COMPANY
ESTABLISHED 1854
BUCKEY, OHIO

RAPID!

Cuts concrete and cuts labor costs to $2\frac{1}{2}$ per square yard. Applicable to floor work and different types of inside horizontal work.

Very efficient in maintenance work of highways.

Boom folds down and readily trailed by any light truck. Make your compressor treble its output by hooking it to this machine.

**Rapid Pavement
Breaker Co.**
1517 Santa Fe Ave.
Los Angeles 21, Calif.

Maj. Bishop New General Manager of Kotal

Major H. Berkey Bishop has been appointed general manager of Kotal Co. of Summit, N. J., at 52 Vanderbilt Ave., New York. He is a son of Howard B. Bishop of Summit, N. J., proprietor of Kotal Co., and served for four years as executive officer of the Southwestern Proving Ground of the Army Ordnance Department at Hope, Ark. Major Bishop was graduated in 1937 from Massachusetts Institute of Technology and holds their degree in business and engineering administration. Prior to entering the Army, he was Superintendent of the Plastics Department of the Vulcanized Rubber Company of Morrisville, Pa. Charles H. Wellings & Co., Inc., industrial consultants of New York, who has acted as general manager of Kotal Co., will continue actively interested in the Kotal business and in other enterprises with Howard B. Bishop.



New Hyster Plant Now Operating

The new Danville, Ill., plant of the Hyster Co. (other factories are located at Portland, Ore., and Peoria, Ill.) is now operating under a production schedule on lift trucks. Deliveries on the Hyster "40," the first 4,000 lb. capacity fork-type lift truck on pneumatic tires, have started. Under the direct management of Frank L. Ross, vice president in charge of all Eastern activities of the Hyster Co., the new plant is expected to be in full production by fall. Both the 3,000 and 4,000 lb. capacity Hyster trucks will be manufactured at Danville. Other models, including the 7,500 and 15,000 lb. fork-type trucks, the 12,000 and 30,000 lb. straddle truck lines, and the Karry Krane will continue to be manufactured in the Portland, Ore., and Peoria, Ill., factories. Operating personnel of the new Danville plant includes Jay Misenheimer, factory manager; Jim Woodley, assistant factory manager; William Morrow, purchasing agent, and Ray Smith, office manager.



Rogers Diesel Changes Name

Rogers Diesel and Aircraft Corporation has changed its name to R. B. Rogers Companies, Inc. The list of Rogers companies has grown so much in the last few years and their activities expanded to such an extent that the old name no longer applies. The Rogers group of interests includes the Indian Motorcycle Co. and the Ideal Power Lawn Mower Co. of Springfield, Mass.; Hill Diesel Engine Co. of Lansing, Mich.; Edwards Co. of Sanford, N. C.; Fox Industries of Philadelphia; Rogers International Corporation of New York, and others.

B-G Distributors

Barber-Greene Co., Aurora, Ill., has announced the appointment of new distributors in Texas and Louisiana. With these changes, users of Barber-Greene equipment in the Southwest are provided improved source of supply and service facilities. Barber-Greene representation in the Southwest now consists of the

following:

Texas: Overton & Ross, 2701 Main St., Dallas; Cochran Equipment Co., 200 Portwood St., Houston; Engineered Sales, 222 North Drive, San Antonio; Fred Berryhill Eqpt. Co., 710 "Q" Ave., Lubbock; Contractors Eqpt. & Supply Co., 1420 Myrtle St., El Paso.

New Mexico: Contractors Eqpt. & Supply Co., Springer Bldg., Albuquerque.

Colorado: Ray Corson Machinery Co., 1600 15th St., Denver.

Louisiana: Southern Eqpt. & Tractor Co., Monroe and Baton Rouge.

Kansas, Oklahoma and Western Missouri: Paul L. Matchette Co., Railway Exchange Bldg., Kansas City, Mo.

In addition, in order to provide special assistance to Barber-Greene representatives and their customers, Barber-Greene Co. maintains Area Sales and Service, with headquarters at 835 Irwin-Keasler Bldg., Dallas. E. H. Cooper is Area Sales Manager, and George Kouth, Area Service Manager.

John W. Anderson Promoted

John W. Anderson, until recently assistant manager of the Birmingham, Ala. office of Ceco Steel Products Corporation, has been appointed manager of the firm's Oklahoma City sales district. He replaces R. K. Alexander, who has been placed in charge of Ceco's sales office and warehouse in Houston, Tex. Mr. Anderson joined the Ceco organization in 1938, after having spent three years with Construction Products Co., Omaha, Neb.

Appointed Manager Dallas District

George Hajek, for 12 years sales engineer for Ceco Steel Products corporation at Chicago, Ill., has been appointed manager of the Dallas, Tex., sales district. He replaces J. C. Boyce. Before joining the Chicago office of Ceco in 1926 as a draftsman, he was with the Illinois Power and Light corporation in the same capacity. In 1934 Mr. Hajek was transferred to Ceco's sales division as sales engineer.

1/2 Cu. Yd. 8' Lift

FRONT END LOADERS
for Industrial Tractors
Write for Catalog

Elkhart White Mfg. Co. Indiana

3 1/2-5 TON — VARIABLE WEIGHTS

Engineered refinements and rugged strength have earned for these rollers enviable performance records. Compact design gives efficient operation in close quarters. Ideal for maintenance work on highways, airports and parking areas. Fine for driveways, docks, etc. Easy to operate. They do a good job at low cost.

Write for New Illustrated Folder.

MANUFACTURED BY

Lewis Manufacturing Co.
SAN ANTONIO 6, TEXAS

P. O. BOX 500

NOW
THE MODERN
SPENCER POWER
DRIVEN STEEL POST
DRIVER

Does the work of 8 men with only 2 men. THEY HAVE BEEN PROVEN IN THE FIELD. SEVERAL STATE HIGHWAY DEPTS. HAVE USED THEM THIS SEASON.

ALSO

COUNTY HIGHWAY DEPTS. HAVE USED THEM FOR TWO YEARS AND ARE ENTHUSIASTIC USERS.

Power take-off
or
Motor Driven.

Will drive 1,000 to 2,000 snow fence posts per day with only two men and with less labor than they would do it by hand. Simply load up the truck with posts and while they are being distributed, in very little more time they can be driven. Mounts on truck or tractor. Saves posts, trucks, labor, and time at the season when they all are so necessary. Write for full particulars and further information.

Distributed by:

MURRAY SALES, INC.
302 Insurance Exchange Building,
Sioux City 13, Iowa

CLEARING HOUSE

FOR SALE

1—Foote Paver \$3,000.00
 1—Huber Roller, Gas, 10-ton—
 3-wheel 1,250.00
 3—Steam Tandem Rollers (Prices vary)
 1—Barber-Greene Ditcher... 2,500.00
 2—Drott Universal Bull Clam
 Shovels (New), each.... 500.00
 1—Buckeye Sub Grader, 10'
 to 12' 3,250.00
 1—Iroquois Asphalt Plant
 2,000 lb. box.....15,000.00

PHIL H. McQUIRE

P. O. Box 34, Norfolk, Va.

— NOTICE —

The Virginia Department of Highways Needs Road Build- ing Equipment

Will Purchase or Rent

Crawler Tractors with Angledozers or Bulldozers.
 Motor Patrol Graders.
 Power Shovels and Cranes.
 Crushing Plants, etc.

If any of above equipment is available, contact:

**Equipment Engineer,
 Department of Highways
 Richmond, Virginia**

FOR SALE

Brand new 1½ c.y. Link Belt Speeder 1946. Series 300. Used two months. Available in 60 days.

Two LS85 heavy duty ½ Link Belt Speeder Shovels with combination attachments.

One 40A Loraine with shovel and attachments.

Eight FN 1942 Mack Trucks. Heavy duty—6 c.y. WL body. Excellent for rock work.

Three 1946 Ingersoll Rand 315 C.R. Compressors with new wagon drills. Used two months. Mounted on pneumatic tires. International Diesel power.

One 1946 Jaeger 315 Compressor. International Diesel Power. Mounted on pneumatic tires. Used six weeks.

The above equipment is now working and project will be completed within 60 days. Ceiling prices and under. Contact:

GENERAL SUPPLY CO.
 Box 55 Bridgeport, Conn.

AIR COMPRESSORS

Curtis Two-Stage Air Cooled 5½ H.P. Briggs & Stratton Engine

Compressor, two-stage, size low cylinder. Bore 4-3/16, stroke 3 1/4. High cyl. 2 1/4 x 2 1/4. Air cooled. Displacement—17 C.F.M. at 200 lb. pressure, 24 C.F.M. at 100 lb. pressure. Engine Briggs & Stratton 5½ H.P. Air Cooled Model Z. Air receiver size 16 x 44 A.S.M.E. Complete with centrifugal unloader, (unit idles when maximum pressure reached). Safety valve, pressure gauge, draincock, 4 air discharge outlets, 50 ft. air hose. Manufactured by Curtis Compressor Co., St. Louis, Mo. Brand new in original factory crates. Shipping weight 700 lbs. Can be operated with 3 or 6 H.P. electric motor.

Regular \$475.00 Value for \$348.00
 F. O. B. Chicago or Youngstown, O.

J. & H. EQUIPMENT CO.
 Dept. 12, 1132 S. Canal St.,
 Phone Webster 7770 Chicago 7, Ill.

FOR SALE

Available for immediate shipment one new one-ton pugmill mixer complete with manganese liners and all paddles, roller bearings and steam or air operated mixer gate, at the reduced price of \$1500.00. Location near Philadelphia, Pa.

Box 212 Roads & Streets
 330 So. Wells St. Chicago 6, Ill.

FOR SALE

(Subject to prior sale)

Koehring 27E Paver. Serial No. 16409, first class working order. Has new Drum as stand-by.

Flexible Road Joint Finishing Machine, 18 feet to 25 feet, with double screed. Quantity of 8 and 9 inch Steel Forms. 6 inch Rex Pumpcrete.

Two Buffalo 8-10 Ton Tandem Rollers.

Location: El Paso, Texas.

HENRY THYGESEN & COMPANY
 P. O. Box 876
 Albuquerque, New Mexico

TRANSITS and LEVELS

New or Rebuilt Sale or Rent

Headquarters for REPAIRS—any make. Factory service. We will also buy your old instruments or take them in trade.

A complete line of engineering Instruments and Equipment for Field or Office. Write for Bulletin RS-18.

WARREN-KNIGHT CO.

Manufacturers of Sterling Transits and Levels
 136 N. 12th St. Philadelphia 7, Penna.

FOR SALE

Northwest Dragline, 1½ yd. bucket, 40 ft. boom. Caterpillar Tractor with LeTourneau Bulldozer. Adams 12 ft. Tandem Drive Motor-Grader. 5 Trailer type Bottom dump Euclid. 9 1/4 yd. Priced for quick sale as a unit or will sell hauling equipment separately.

Box 201, Roads & Streets,
 330 So. Wells St., Chicago 6, Ill.

**Wanted: Used Wheel Barrows,
 Roller, Scraper, Mixer.**

Arthur Ley

La Plata Maryland

FOR SALE

Late model DEMPSTER DUMPSTERS, LF-200, including buckets \$500.00
 New Quick-way Truck Crane, model E, including ½ yd. dragline bucket. Present factory price less 5% 100 cu. ft. art. SCHRAMM 2-stage compressor, mounted 2-ton Indiana truck. Bargain... \$1,750.00
 315 cu. ft. latest model SCHRAMM Portable Compressor. Like new..... \$2,800.00
 M. Wenzel, 2138 Jefferson, Kansas City, Mo.

FOR SALE

2 Buffalo Springfield Steam Tandem Rollers. 1-eighth ton, 1-ten ton, \$500 each. Location Long Island City, N. Y.

Box 210, Roads & Streets
 330 So. Wells Street Chicago 6, Ill.

EXCEPTIONAL BARGAIN

Immediate Shipment

1—Barber-Greene model 558 Snow Loader
 —Nearly new.

PAUL L. MATCHETTE COMPANY
 Tel.: Day-HA. 4166; Night-HI. 3377
 Distributors for Barber-Greene Co.,
 705 Walnut St. Kansas City 6, Mo.

FOR SALE

Mack Trucks for Sale: 15 Heavy Duty Mack Chain Drive Trucks, 8-Yard Dump Bodies. Good for Quarry & Pit Work.

DUMP TRUCK SERVICE, INC.
 50 Wecker Street Buffalo (15) N. Y.

FOR SALE

12,500 Watt A.C. Generators 1 or 2. Built by Master Vibrator Company with air cooled gasoline motors. Practically new. Will sacrifice for quick sale.

SAVOY BALL ROOM
 4733 South Parkway Chicago, Illinois

TARCO
TAR and ASPHALT
POTS, BUCKETS
DIPPERS

Types for crack sealing, pouring expansion joints, coating pipes, applying waterproofing, sprinkling road oil, and any special types to your order.

TARRANT MANUFACTURING CO.
SARATOGA SPA, N.Y.

TARRANT MFG. Company
Saratoga Spa
N.Y.



THE McCARTER IRON WORKS, INC.
NORRISTOWN, PENNA

New Davey Distributor

Appointment of Wabash Equipment & Supply Co., Indianapolis, as distributor of Davey Compressors, is announced by Paul H. Davey, president, Davey Compressor Co. Wabash will offer complete sales and service facilities on all Davey items, including portable and stationary compressors, truck power take-offs, Auto-Air and Track-Air Units, Mobile Machine Shops, power saws and portable lighting equipment.

The Wabash Equipment & Supply

Co. was founded in April by R. W. "Bill" Schwartz following his return from 40 months service in the U. S. Navy. Company offices 310 Test Building, 54 Monument Circle, Indianapolis. Sales and service branches will be opened in Ft. Wayne and at a southwestern Indiana location. Wabash also represents Wayne-Crane, Page Engineering Co., Pettibone-Mulliken Co., The Shovel Supply Co. and Winslow Government Standard Scale Works, Inc.

Palmer to Gar Wood Newport News Plant

John J. Palmer, veteran of forty years in the automobile and allied industries, has been named manager of the Newport News, Virginia, plant of Gar Wood Industries, Inc. Mr. Palmer was formerly vice-president of the Horace E. Dodge Boat and Plane Corporation whose properties were recently leased by Gar Wood for its Newport News plant where it will make motor boats, light road machinery and truck tanks.

Mr. Palmer entered the automobile business in 1907 with the Dayton Motor Car Company which made the Stoddard-Dayton car. He became export manager of Dodge in 1925 after several years as its European representative.



J. J. Palmer

Hercules Steel Products

As the first step in a projected expansion program, the capital structure of the Hercules Steel Products Company, Galion, Ohio, has been reorganized, although this organization is to continue operation as an unincorporated subsidiary of the newly set up Hercules Steel Products Corporation



EMBURY AIR PILOT LANTERN

ON EVERY JOB

It's Stormproof!

Order through Your Jobber
EMBURY MFG. CO., WARSAW, N.Y.



of Delaware. The latter will serve as holding company for the subsidiary and will also control the stock of The Galion Metallic Vault Company. There is no change in the management of either of the operating companies and the reorganization is designed primarily to obtain wider distribution of the capital stock of the holding company. This stock, it is expected, will in time become a listed security. Additional working capital to be thus obtained will support plans to increase production of Hercules hoists and dump bodies through expansion of the plant and equipment. L. M. Liggett is president of both companies.

RELIANCE

CRUSHING, SCREENING
and WASHING UNITS

Up to 2000 Tons a Day

- Crushers
- Elevators
- Sweepers
- Screens
- Wash Boxes
- Bins
- Pulverizers
- Feeders
- Spreader
- Kettles
- Conveyors
- Drag-Lines
- "GAYCO"
- Centrifugal
- Air Separators

UNIVERSAL ROAD MACHINERY CO.
Kingston, N.Y.

Canadian Representatives: F. H. Hopkins & Co., Ltd.
340 Canada Cement Co., Montreal, Que., Can.

VULCAN PAVEMENT AND CLAY DIGGING TOOLS

ARE MADE in a complete line of sizes to fit all standard compressed air hammers.

Send for NEW Vulcan Illustrated CATALOG today.

VULCAN TOOLS — THE WORLD OVER —
NOTED FOR QUALITY AND DURABILITY

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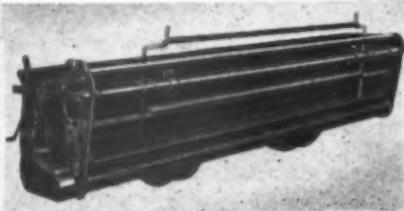
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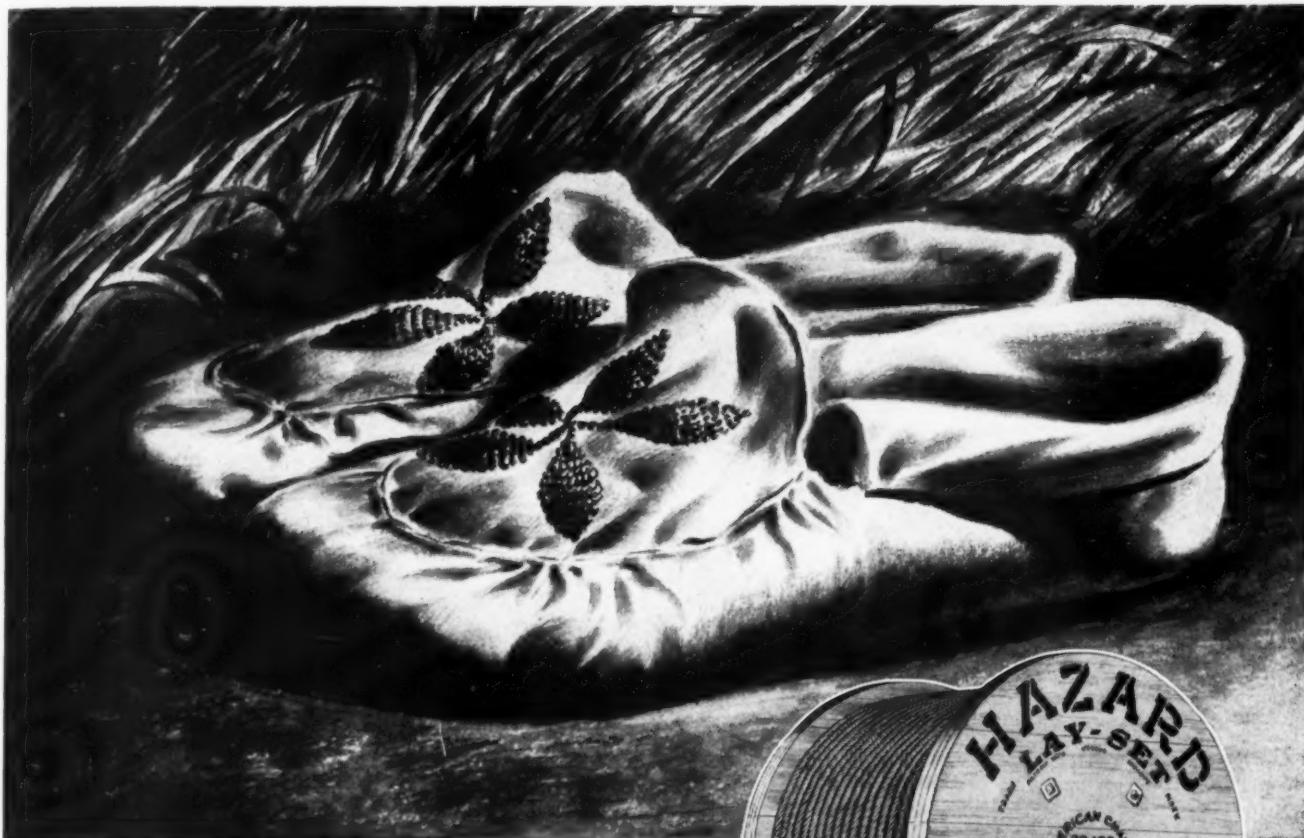
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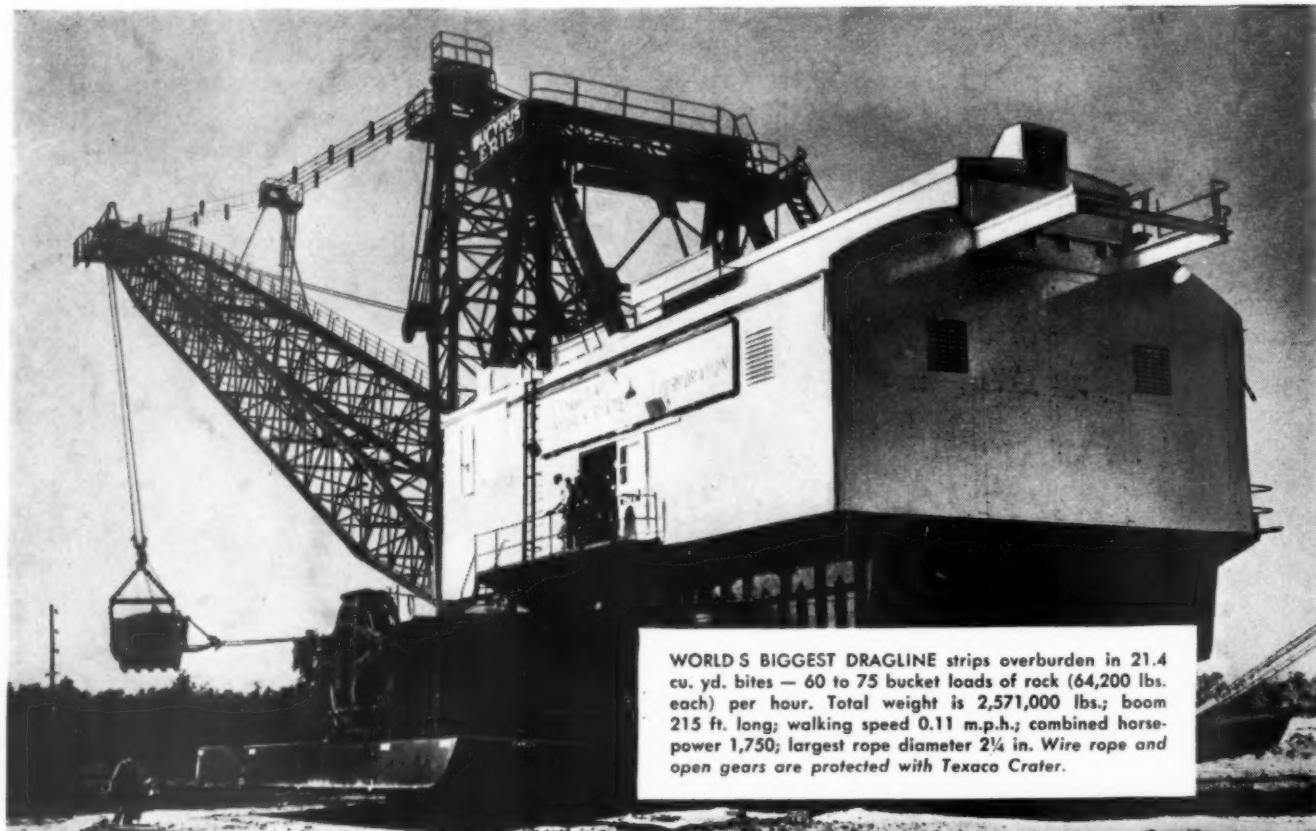
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